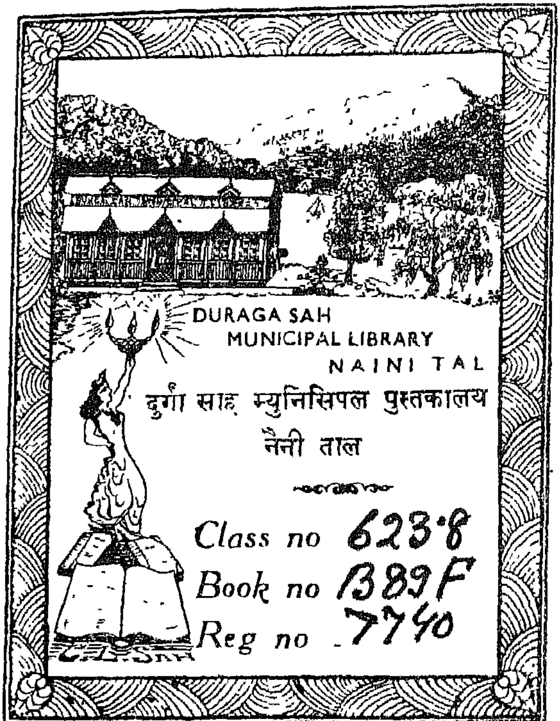

'He that commands the sea is at great liberty and may take as much and as little of the war as he will.'

Francis Bacon's maxim, true in his own time, was an essential tenet of British foreign policy for nearly four hundred years. The influence of British sea-power on European conflicts and the struggle for empire overseas was a constant thread in the Island's endeavour to maintain a favourable balance of power.

Although, during the centuries before the advent of the aircraft carrier and, later, the seaborne atomic missile which changed the whole strategic aspect of sea-power, Britain was able to challenge the navies of Europe and establish a world-wide supremacy, it was sometimes due more to the qualities of her seamen and the determination of the administrators of her navy than to the superiority of her naval architecture.

Douglas Browne's study of the development of fighting ships, from the building of the *Henry Grace à Dieu* at Woolwich in 1514 to the eclipse of the capital ship with the Battle of Midway in June 1942, takes full account of this situation. He points out that during the eighteenth century the French and the Spanish, working to scientific principles, built ships which consistently outsailed any that British yards, using the old rule-of-thumb methods, could produce. Yet thanks to the brilliance of her seamen, culminating in the genius of Nelson, the British navy prevailed (just as in the Dutch Wars of the previous century, daring and resolute commanders like Tromp and de Ruyter defied England's sea-power, although their ships were smaller and were poorly constructed).

While the emphasis of *The Floating Bulwark* is upon British ship construction, it is not studied in isolation, and foreign innovations, which often exerted a decisive influence (especially during the nineteenth century), are also examined. And to illustrate the influence of advances in design upon naval tactics, and conversely of naval tactics upon design, Douglas Browne gives brief accounts of some of the world's important sea battles - not only those of British history from the Armada to Jutland, but also such significant encounters as the battles of Lissa, the Yalu and Midway, as well as the memorable clash between the *Merrimac* and the *Monitor*. The final view, therefore, is of the world-wide development and deployment of the battleship through more than four centuries, in a wide-ranging study which takes in the complete life-span of the capital ship.

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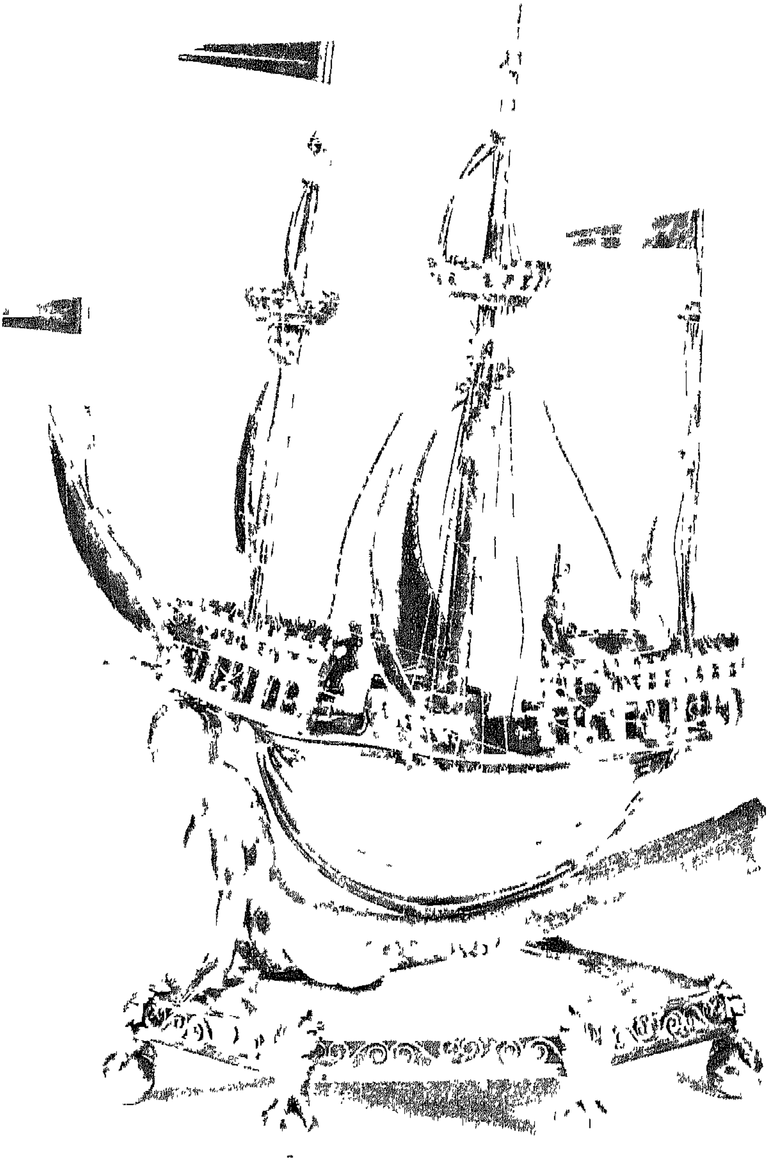

The Burghley Nef
Model of a three-masted French ship, 1482

DOUGLAS G. BROWNE

The Floating Bulwark

The Story of the Fighting Ship: 1514–1942

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TO
INNES ROSE

Preface

In this attempt to deal with a very large subject, the development of the fighting ship, the story is told primarily from the standpoint of the British navy. It begins when heavy guns were first put on British ships, converting them from part-time to full-time vessels of war. Except for one or two excursions into the cruiser class, treatment is limited to the capital ship, the true embodiment of Sir William Blackstone's 'Floating Bulwark'.

Clarendon had made a very similar use of this analogy a hundred years before, and in Blackstone's day 'bulwark' was still exclusively a military term. Usually a stretch of rampart or wall, its meaning as a closed or partially enclosed work survives at Berwick-upon-Tweed, where beyond the Elizabethan bastions, on the line of the medieval wall, a grass-covered mound perpetuates the memory of the Great Bulwark in the Snook. When this English word of Dutch or Teutonic derivation went afloat, soon after 1800, it was reverting to its original sense of log-work or boll-work. Popularized, perhaps by Campbell's 'Battle of the Baltic'—only a few months before the battle the poet had seen the Danish ships 'lay their bulwarks on the brine' off Copenhagen—its military associations withered and died; and in common English usage, in spite of the dictionaries, it is now purely nautical. In France, a land power, the name has met a quite different fate—it has become *boulevard.*

There have been ships named *Bulwark* in the Royal Navy, and in the latest, an aircraft carrier, the old and new usages of the name are happily conjoined in the motto, *Per mare, per terram,* of the Royal Marine Commando which, with its helicopters and landing craft, forms her striking force.

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Illustrations

**Photographs by courtesy of the Trustees, National Maritime Museum*

†Photographs by courtesy of the Imperial War Museum

Acknowledgements

THIS book is largely a work of piracy. It is hoped that references in the footnotes will adequately emphasize the debt owed to those sources most heavily drawn upon. Some of these, however, demand more precise acknowledgement. In the chapters on the Armada, long-cherished beliefs are revised in the light of recent publications by Professor Michael Lewis. For the eighteenth century, much use has been made of John Fincham's *History of Naval Architecture*. Fincham, who wrote other books on his craft, was Master Shipwright at Portsmouth during the last years of the wooden warship. For the early period of the ironclad era that followed, Lord Brassey's *The British Navy*, published in 1882, is a mine of information and a valuable guide to contemporary opinion, which in these days sometimes reads rather oddly. Dr. Oscar Parke's *British Battleships*, covering the whole era, from the *Warrior* of 1860 to the *Vanguard* of 1944, is in every sense a monumental work, and is indispensable to any writer on the subject; equally so, for a comprehensive survey of the naval scene during this period, up to the Second World War, is Bernard Brodie's *Sea Power in the Machine Age*.

For the illustrations the Author and the Publishers are indebted to the Trustees of the National Maritime Museum; to the Director General of the Imperial War Museum; to the Director of the Science Museum; to the National Archives and Records Service, Washington, D.C.; to Mr. W. P. Trotter and the Oscar Parkes Society; to Messrs. Christie for the photograph of the Burghley Nef, and to the authorities of the Victoria and Albert Museum for permission to reproduce it.

Thanks are due to Mr A. H. Waite, of the National Maritime Museum, for valuable advice, and for help and information to the Rev. J. R. Powell, Mr Gilbert Roberts, M.I.Chem.E., Miss Joan Bailey of the London Library, Miss Mia Cresswell of the United States Naval Headquarters in London, and the Dover Harbour Board.

The Royal Navy of England hath ever been its greatest defence and ornament; it is its ancient and natural strength—the floating bulwark of our island.

Sir William Blackstone: *Commentaries*

PART ONE

BIRTH OF A NAVY

CHAPTER ONE

Before the Battleship

1

A REMARKABLE ship was completing her fitting-out in the Thames off Erith, on the Kentish shore of the river between Gravesend and Woolwich. Shipwrights swarmed about her like ants, rigging and painting. With her four masts and her immense superstructures forward and aft she towered over the merchantmen coming up Erith Reach. Above a black hull the superstructures blazed with crimson and blue and the colours of the Tudors, green and white; streamers and banners and flags, bearing the Tudor Rose, St. Georges, dragons, portcullises and pomegranates, were ready at the hoists. The year was 1514; the big ship was named the *Henry Grace à Dieu* (or *de Dewe*, as some preferred it), after the king who had ordered her construction and was paying for it; and the king himself was coming on one of his many visits to the pride of his new navy. He would no doubt come dressed for the part. Henry VIII is the first known Englishman to indulge in the fashion of getting into uniform for some sport or pastime. A keen lover of the sea, he had devised a costume for cruising—vest and breeches of cloth of gold, and scarlet hose. Thus arrayed, the gold whistle of an admiral and a piece of unicorn's horn hung round his neck, he had witnessed the launch of the *Henry Grace à Dieu.*

This is a fanciful picture, but some such scene took place, and the cause of it is of importance in naval history. Events long past, for which the evidence is uncertain or conflicting, are represented in human memory by symbols. The very inventions which made possible the building of such a ship are ascribed to a German monk and a Breton shipwright, neither of whom is likely to have been the first in his field. There is no mystery about the *Henry* herself; we know what she looked like, and an inventory survives, under several hundred headings, of all her 'Stuff, tacle, apparell, Ordynance, artilleries and habillimantes', from masts and ropes and

hawsers, cannon and shot and hackbuts, to long-bows and bills and sets of armour.* But she has none the less become a symbol. Merely the latest and biggest of a novel class of vessels created within a generation, she alone has come alive, the one finished portrait amidst the shadowy forms of her forerunners. Some of these were still in commission when she was launched, but little is known about most of them apart from their names.

The vagueness of her background has bred legends about the great ship herself. Was there one *Henry Grace à Dieu*, or were there two, built in successive reigns? Was the *Great Harry* a different ship altogether? Modern research may find little support for such fancies, but even scholars, faced with a puzzle, feel the need to simplify; and convenience has fastened upon the greatest of Henry VIII's 'great shyppes' the distinction of being the prototype of the modern, as opposed to the medieval, man-of-war.

2

In England the Middle Ages came to a sudden end at Bosworth Field. To those interested in England's development as a naval power, the outstanding feature of a new order of things, under a new type of monarchy, is the immediate creation of a Royal Navy in the sense understood today.

The medieval ship in general use in northern European waters was a shallow-draught tub, her length being not much more than twice her beam, She carried a large square sail on her mainmast, and a smaller one on a mizzen. Very stoutly built, and often of considerable size, she was a rounded box designed to carry as much cargo as could be crammed into her. She cannot have sailed anywhere near close to the wind, and on a lee shore in a rising gale she must have been a terror. Records of loss by shipwreck in a medieval mercantile fleet are lacking, but it must have been appallingly high.

A king of England would own a number of these 'round ships', which, like his subjects, he used for trading. In time of war he would call upon the Cinque Ports for their quotas, and hire other ships from private owners. To adapt these craft for fighting,

* M. Oppenheim, *History of the Administration of the Navy*, 1509–1660 (1896).

light temporary structures would be raised forward and aft to carry bowmen, slingers and other soldiers with missile weapons, which in time came to include small guns.

Naval tactics under sail had not changed radically since the unseamanlike Romans built their first fleets during the Punic Wars. Each ship tried to run alongside an enemy, grapple her and board her. Soldiery in the high temporary 'castles' swept the opponent's castles and deck with arrows and stones; if their own ship was boarded, they could pour a cross-fire into the waist. The clumsy, clinker-built vessels, to which the English gave the appropriate name of 'cog', crashed together so violently that they sprang leaks, as happened to the flagships of Edward III and the Black Prince in the great sea-fight known as 'Les Espagnols sur Mer', when the Prince and his people had barely scrambled on board the Spaniard before their own ship went down. In everything, including the castles, it was land warfare transferred to the sea. Knights fought in full armour, and sank like plummets if they fell overboard.

When the emergency was over, the castles were dismantled and the ships returned to their normal occasions. In the commercially minded Middle Ages, to design a ship exclusively for fighting was considered a waste of money everywhere north of the Mediterranean. There, however, things were different.

From very early times the Mediterranean powers had built warships in the form of galleys. There was no room in a galley for anything except the slaves who rowed her, three, four or five to an oar, and a few soldiers on platforms in the bows and the stern. Until the invention of cannon her principle weapon was the beak or ram. The Mediterranean being landlocked and tideless, the galleys cruised along the coast, or from island to island, at night putting into harbour or drawing up on some sandy beach. They were fair-weather craft, designed for speed under oars, with light scantling and low freeboards. To rest the oarsmen a large sail could be hoisted on the single mast.

The 'long ships' of the Northmen appear to be an exception to the fair-weather rule. But though a species of galley, they were more stoutly built and altogether simpler than the Mediterranean oared ship. Primarily sailing ships, they were a form of transport, not designed to fight at sea. For a long voyage they

were decked or half-decked against the weather. When crossing the North Sea to invade Britain, the Northmen either headed for the Shetlands or Orkneys and then coasted down to their landing place, or took the short sea passage from the Low Countries. To reach North America by way of Iceland (if they ever did this) was a far more venturesome undertaking, and a remarkable feat; but in considering any of these voyages by open or semi-open craft, it should again be remembered that the figure of losses by shipwreck is unknown.

By Tudor times the introduction of artillery had transformed the Mediterranean galley. It was longer and stouter, the ram had been discarded for an iron beak above water, and several guns were mounted on the platform in the bows. For actions between fleets of galleys elaborate tactics had developed, at which the Venetians and the Genoese excelled.

Northern European waters were too stormy for the true galley. Only the French made serious attempts to conduct galley warfare in the Channel. For more than two hundred years squadrons of these fast but fragile craft were based on Dunkirk and other ports. Employed to raid English coastal trade, at times they were a great nuisance, but they were too dependent upon fine weather ever to become a serious threat. The 'galley' which from very early times figures in these waters was a quite different vessel—anything not too big to carry auxiliary oars or sweeps, as small gun-brigs still did in Nelson's day. As late as the last quarter of the seventeenth century a fully rigged 32-gun ship, such as was soon to be called a frigate, was named the *Charles* Galley because she was designed to tackle Algerine pirates in their home waters and was therefore pierced below her gun-deck for sweeps.

What makes the Mediterranean galley of importance in any history of the fighting ship is her own switch of offensive weapons from the ram to the gun. She was the first vessel to carry heavy cannon.

3

It is immaterial whether the inventor of gunpowder was the German monk Schwartz or some earlier tinkerer with saltpetre, sulphur and charcoal; cannon, at any rate, had been used on land

for nearly a century before they went to sea on anything bigger than a galley. The galley could carry a few relatively heavy guns on her forecastle because of her low freeboard. The extra weight did not make her top-heavy. It was otherwise with the 'round ship'. The English called her a 'tall ship', from her high sides, which were sheer. As a cargo carrier she was normally well ballasted; but when adapted for fighting, with castles added and a more or less empty hold reducing her draught, to put cannon on her upper deck would be to make her roll even more wildly than usual. To mount them on the temporary castles was out of the question.

The term 'cannon' is here used in the sense of heavy guns, firing shot of 9lb. or so and upwards. A medieval ship's castles could carry guns of a sort, but these serpentines (named after the powder used) and others of the type, though some of them were quite bulky, were little more than glorified pistols. With a weak charge, they fired shot ranging in weight from a pound or two down to a few ounces. Fixed on swivels along the bulwarks, they were anti-personnel weapons, like the hand-gun and the long-bow itself, and were totally ineffective against a ship's hull. It will be seen that when Henry VII built ships of an advanced type he filled them with these little guns. It was left to his son to add genuine cannon to English naval armament.

The reason for the delay in putting heavy metal into ships was that the port-hole, as we know it, had not been invented. Holes were cut in the galley's sides for her oars, and in a transverse bulkhead in the bows for her guns, but these openings were near the waterline, and though galleys avoided bad weather their oar-holes were often fitted with sleeves of leather or canvas to keep the sea out. The medieval cargo ship, having to face gales and wild seas, presented an unbroken side to the waves. In any case, as long as that side was clinker-built, it could not be cut into. When carvel or flush-sided ships came in, had anyone thought of placing cannon on the lower or cargo deck, where their weight would not affect stability, this was too near the water for unprotected port-holes; and the simple idea of a hinged lid, to render the port-hole watertight, seems to have occurred to nobody until towards the very end of the fifteenth century.

It is attributed to a French shipwright named Descharges, of

Brest, but probably, as in the case of Schwartz and his gunpowder, Descharges is another symbol, the name of an earlier inventor having been forgotten. Whoever it was who first caused a large rectangular hole to be cut in a ship's side, and fitted with a hinged lid, he was not thinking of artillery. He was trying to simplify the loading and unloading of cargo, which by means of the port could be done direct from the quay, instead of by the method of hoisting-tackle swung over hatches in the deck. It was an experiment which did not last, but if it was a French invention it is a very early example of a long series of innovations in naval architecture to be introduced by French shipbuilders.

When and where the next step was taken is unknown—it may have been in a Spanish shipyard—but by the year 1500 the large cargo port had been reduced in size to make a watertight gunport. A few heavy cannon could now be mounted on the cargo deck, among the cargo. But they were there primarily for defensive purposes. The only true warship was still the galley.

4

The mists of uncertainty that blur so many details of a revolutionary period in ship design hang frustratingly about what was the most important step forward of all—the transition from a primitive to a modern type of rig.

The appearance of the medieval ship of northern Europe is known only from such sources as illustrated manuscripts and seals. For centuries it scarcely changed in essentials. At a fairly early date the rudder, worked by a tiller, replaced the steering oar of the Bayeux Tapestry. (The wheel did not come in until early in the eighteenth century.) The ship grew bigger and acquired a lower deck, and the second mast and sail were added. Then the stage was reached when the vessel outgrew her means of propulsion, and she was given a foremast with another square sail. For this the hull had to be lengthened, and sail area again proving to be insufficient, topsails came in. By this time the round ship was not even approximately round and hulls were approaching the ratio of over three to one. Lateens (fore-and-aft sails from India, via the Mediterranean) were adopted for their 'lifting' power, as against the tendency of square sails to force a ship's lee side down.

Neither the more effective foresail or jib, nor the staysail, had then been thought of.

It was from the Mediterranean, where conditions encouraged variety and experiment, that these refinements reached northern waters, but when they began to come, and how long the full process took, are matters of guess-work. It seems probable that when the Wars of the Roses began in 1455 the two-masted round ship was still the standard English type; yet thirty years later, when Bosworth Field brought the wars to an end, a large fully rigged ship, the carrack, carvel-built and of quite different dimensions, was in general use.

King Henry VII, at any rate, coming to the throne in 1485, took over, built or purchased abroad a number of vessels of which it is known that they had three or four masts, fore and main topmasts and topsails, and lateens on their mizzens. The fourth mast was a second mizzen called the bonaventure, stepped well aft. Masts and topmasts may still have been in one piece; if the topmast was a separate spar, there was no means then of striking it.

Representations in any form of English ships of this type and date are very scarce. Since this book was begun a remarkable little model, whose existence, to quote the catalogue, 'has apparently hitherto escaped notice', has appeared in the sale room. Now in the Victoria and Albert Museum, the Burghley Nef is a silver-gilt and nautilus shell salt-cellar in the form of a three-masted ship of about 1480. From the claw-and-ball feet of the plinth to the tip of the mainmast the Nef measures 13⅝ inches. The proportions of the ship's upper works have had to be adapted to the nautilus shell which constitutes the hull, but otherwise details seem to be accurate and complete. Guns are mounted on the battlemented castles forward and aft. Fore and mainmasts have rounded tops, courses and topsails. An unseamanlike person at some time attached the lateen from the mizzen to the bowsprit, and the spritsail to the mizzen. Among figures of sailors, like the guns considerably out of scale, one is climbing the main shrouds. There are a number of *nefs* extant of Continental origin, the ships being chiefly of the medieval single-masted type; the Burghley Nef is French, and can be dated 1482, and for its period it is a great rarity. In view of the very close association between

England and France at that time, and the constant interchange of ideas, this beautiful little object may be taken as a pattern of the ships of Henry VII's fleet.

To this personal fleet, the 'King's Ships', Henry contributed a personal touch, increasing greatly the number of small guns now normally carried. His *Regent* had about two hundred. As they were permanent, the castles on which they were mounted became a permanent part of the ship's structure, the forecastle and poop of the future. Like all English kings before him, however, Henry acquired a fleet to increase his private income; he used it to export and import merchandise, and often hired its ships out to his subjects. The little guns on the castles were purely defensive. In his one Continental war the fleet was employed as transports. The most business-like of monarchs, he held fast to the medieval theory that warships were an extravagance.

His son thought differently. Within a few months of Henry's death the creation of a Royal Navy was under way. Within three years the *Henry Grace à Dieu* was on the stocks, the biggest fighting ship in the world.

CHAPTER TWO

The King's Ships Royal

1

WHEN Henry VIII came to the throne in 1509, the fleet he inherited from his father consisted of about half a dozen ships. Some were large for their day; the burden of two four-masters, the *Regent* and *Sovereign,* may have been 1000 and 800 tons respectively. Tonnage was measured by the weight in casks of Bordeaux wine that the hold would carry, a ton or tun in two casks taking up sixty cubic feet. From one-quarter to one-third of the total was added to give the vessel's deadweight displacement. The figures arrived at by this method are thought to tally fairly closely with those worked out later by arithmetical rules. Few English merchantmen of the period seem to have exceeded 400 tons. The Hanse towns, the Spaniards and the Portuguese were building much bigger ships.

To the name of any vessel belonging to the king the words 'of the Tower' had for long been added, because royal arms and equipment were stored at the Tower of London. It is a sign of the times that Henry VII's *Mary of the Tower* is the last ship so named, and she had gone from the list by 1509.* The Tower was still the main arsenal, but other naval stores were now kept at dockyards in the Thames and at Portsmouth, at which port Henry himself had built the first dry dock in England. The Keeper or Clerk of the King's Ships who supervised this work bore the singularly appropriate name of Brygandine, which besides meaning a corselet of chain mail is an early form of the French *brigantin.* He was to continue in this office under the new king, and he is said to have designed the *Henry Grace à Dieu.*

The new king was not yet nineteen when he thus came into possession of a small up-to-date fleet, intended for trade but protectively armed with light guns—the *Regent,* indeed, fairly bristling with them. Historians, most of whom since Froude have

* M. Oppenheim, *History of the Administration of the Navy, 1509–1660.*

disapproved of Henry, have ignored the one great achievement of his youth. He must have been precocious even in that age of precocity, for the programme of naval construction upon which he launched immediately after his accession had clearly been planned in advance. He was interested not only in ships and shipbuilding—he is said to have been a practical shipwright—but in the growing science of gunnery. As a mere boy he could have discussed his ideas for a new sort of navy with Brygandine and other designers. Now his opportunity had come. The 'great ship', the carrack, had already arrived, and he owned several of the class himself. The invention of the gun-port enabled cannon to be mounted on the lower deck. Unlike his peace-loving and provident father, who had left him a fortune as well as a fleet, Henry was full of expensive ideas and warlike ambitions. He saw that heavy guns could be put to better purposes than fending off pirates or incidental use in some scrambling sea-fight for which the gun-carrier had been borrowed in between trading voyages. He would make England the first country outside the galley-ridden Mediterranean to possess a battle fleet.

It has been noted that he wasted no time. Between his father's death in April and the end of 1509, not only was the keel laid of his first battleship, to be named the *Mary Rose* after his sister, but he had placed orders for enough tin, a constituent of bronze, for the casting of a hundred cannon.

2

The earliest little guns had been cast, usually of brass. It was beyond the gunsmiths of that time to cast bigger pieces, and these were 'built up'; lengths of forged iron having been placed round a circular core of wood, red-hot iron rings were forced over them. When the rings had shrunk with the cooling of the metal, the wooden core was burnt or bored out, leaving an iron tube, open at both ends. To one end a chamber was fitted, containing the charge and the shot, a stone ball. The tube had become a breech-loading gun.

It was lashed to a rudimentary carriage, a flat slab of timber called a bedstock. A wooden baulk driven into the ground took the recoil. The bedstock itself, lying on the ground, had to be

tilted to give elevation. The gun could not be traversed; it fired straight ahead and its range was fixed, so that it was of little use except against a fixed target. This was the type of cannon and mounting first put on the forecastle of a galley, and it was aimed by the ship herself, acting as an immense gun-carriage.

The loading chamber was in time superseded by a breech-block screwed into the gun, quite in the modern manner. Some of these built-up breech-loaders were now very large; Mons Meg at Edinburgh has a calibre of 19½ inches.

By 1400, however, if not earlier, brass and iron cannon were being cast in Europe. The bore, at first formed by a core of wood, was later drilled through the solid metal. The screw breech-blocks were never satisfactory, and the new guns were muzzle-loaders. Unlike the built-up gun, the metal of which was of the same thickness throughout, cast guns could be thickened at the chamber end, enabling the chamber to take a more powerful charge. Trunnions came in, to make elevation easy. By 1450 the carriage had been put on wheels. In essentials, the gun that was to be used on land and sea for the next four hundred years had arrived.

It was still only arriving in England by purchase abroad when the new century came. There was no gun foundry in the country. But there were bell foundries, and it is another instance of Henry VIII's youthful foresight and determination that he turned bell founders to casting guns—hence his orders for tin. A rhyme has it that:

> Master Huggett and his man John,
> They did cast the first can-non.

While these foundries were getting under way the king had to buy the new muzzle-loaders on the Continent, chiefly in Flanders, and for a long time built-up cannon formed a high proportion of the heavy artillery he put on board his fleet.

Some sort of naval gun-carriage, with small solid wheels or trucks, and breech-tackle to take the recoil after firing, was in use by the year 1500; the *Henry Grace à Dieu*'s 'Inventorie or boke' of 1514 shows that she had wheeled carriages for such heavy pieces as the 'Grete yron gonnes of oone sort that come owt of fflaunders'.* A question that has been raised is how these carriage

* M. Oppenheim, *History of the Administration of the Navy, 1509–1660.*

guns on a sixteenth-century ship were loaded. Obscure references to early gunnery fights at sea seem to suggest that long after this date broadside guns were lashed to the ports with their muzzles protruding, and were loaded outboard. There is even a drawing by one of the Van de Veldes which appears to show this extremely awkward process still in force in the second half of the seventeenth century, men sitting astride the gun, or on the portsill, to drive the rammer home.*

Up to the time of the Armada, and later, a ship's complement included only about as many gunners as she had guns, and it is argued that this was because guns lashed to the ports did not need trained gun-crews to manhandle them. But it seems against probability and common sense, to say nothing of most accounts of early broadside actions, to suppose that the uses of recoil for the purpose of loading inboard, under cover, were not quickly appreciated. Given wheeled carriages and breech tackle, their rational employment seems to follow; nor was it any novelty on shore in Henry VIII's time. Guns were mounted on such carriages in forts, which resembled ships in having tiers of embrasured casemates, as may be seen in the surviving circular or multi-circular little castles built by Henry himself for coastal defence. The artillery of a fort under close attack cannot be loaded from outside. On a ship, moreover, fixed or lashed guns could only be trained by the movements of the ship herself, as in the case of the built-up guns first put on board galleys. On a galley, incidentally, outboard loading of the later muzzle-loaders could if necessary be effected easily, if not always safely, from the platform outside their bulkhead—a very different matter from sitting on the gun-muzzle or the portsill. Probably Van de Velde made his sketches, clearly drawn in harbour, because he was struck by the unusual sight of a gunner swabbing out his piece in this inconvenient way—the most likely reason being that the man was single-handed. In normal reloading the long staves of sponges and rammers protruded outside the gun-port, and in action the men handling them were exposed; it was not until the end of the eighteenth century that the invention of flexible staves enabled port-lids to be closed for reloading.

As for the small number of trained gunners on a Tudor ship,

* *The Mariner's Mirror*, Vol. 18, No. 1, Jan. 1932.

no doubt they were gun-captains, a gun's crew being found from among the soldiers on board. These were there only to meet the emergency of an attempt to board, and in the gun battles, for which by then an English fleet was trained, they were free for other duties.

On ships of this and much later periods there was one deck on which room had to be made for the recoil of the guns—the upper deck, in the waist. The ship's boats (except at first the long-boat) were stowed here, and in action they had to be got out of the way after light culverins came to be mounted on this deck. Usually the boats were towed, but this affected the ship's steering, and sometimes they were cut adrift. It was not until about 1750 that the introduction of skid-beams in the waist above deck level (they became known as the 'booms') enabled boats to be kept permanently on board.

3

As originally built, the *Henry Grace à Dieu* carried some thirty broadside guns. It does not follow that they were all mounted on the broadside. On her great castles was the usual array of anti-personnel weapons, to the number of more than a hundred and fifty; but though tactical ideas still envisaged closing and boarding, and another half-century was to pass before this secondary armament was drastically reduced, it was already on its way out when the *Henry* was allotted her heavy artillery in 1514.

These heavy pieces, all designed for land warfare, can be classified as cannons, perriers and culverins. Biggest of all were double and whole cannons, but they were really siege guns, and though a few whole cannons, firing 8-inch, 50- or 60-lb. shot, were for some time to come put on ships, the type need not be considered further. The demi-cannon is altogether more interesting, because it was to become the British navy's standard heavy gun. A 30- or 32-pr., it was in Henry VIII's day, as it was to remain, relatively a short gun—ten feet in length. Powder being then what it was, the extreme range of a demi-cannon was probably well under a mile, and its effective or point-blank range two or three hundred yards. A two-decked ship, which the *Henry* may have become (that is, carrying big guns on two decks) would have her demi-cannons mixed with culverins on the lower deck.

The perrier was a short, light gun firing 'carcasses' of stones and bullets, case-shot and 'fireworks' as well as stone round-shot. Intended for very close fighting, the perrier fell out of use. There was a hybrid, the cannon-perrier, but it was obsolescent by the end of the century. Perriers were to be succeeded, in course of time, by the carronade.

The culverin was a long gun for the weight of metal it threw. A whole culverin, with a calibre of 5 to 5½ inches, firing a 17- or 18-lb. shot, was at least thirteen feet long. There was a whole range of culverins, but the one to survive, like the 30- or 32-pr. demi-cannon, was the 9-pr. demi-culverin, of 4½-inch calibre. It was to become well-known as the 'long nine'. Its long barrel gave it an extreme range of well above a mile, and later it was often mounted as a bow or stern chaser.

All cast guns except the perrier fired iron shot, but the small breech chambers of the built-up guns would take only very weak charges, and for them the lighter stone shot were provided. Neither building up nor the gauging of stone shot was a precision process; by comparison, cast guns had a uniform bore, and shot could be cast to fit it, but as they were never perfectly spherical, the fit was never exact, so that in these early days every type of cannon suffered from far too much windage, the air space between shot and bore, with consequent waste of the propelling charge and loss of range and accuracy.

Such was the main armament, built-up guns included, with which Henry furnished his new ships, now the 'King's Ships Royal'. Of the cast guns purchased abroad, brass pieces were more in demand than iron. Ideas about the practical use of broadside fire were everywhere still vague in the extreme, and at the end of Henry's reign his fleet of over fifty ships (more than half of them being pinnaces, row-barges and other small craft of under 100 tons) then carried more than two thousand guns of all kinds. On the great *Henry Grace à Dieu*, as has been mentioned, there were nearly two hundred.

4

There is a well-known painting, attributed to Vincent Volpe, of Henry VIII's 'great ships' lying off Dover at the time of his

embarkation to meet Francis I of France at the Field of the Cloth of Gold. In the foreground is the new stone jetty, with its small round castles, the muzzles of cannon projecting from their embrasures. Where the jetty was, the Admiralty Pier was built in modern times, having its own castle in the form of a revolving turret carrying two 80-ton muzzle-loaders.

The painting, like the opening paragraphs of this book, is a fanciful picture. For the short Channel crossing Henry used a squadron of small ships. Nor could the big ones depicted by the artist have anchored anything like so near the jetty as he has put them. The painter, however, has done us a great service. He has shown us what the new battleships looked like. While some are anchored very near the jetty, what is generally thought to be the *Henry Grace à Dieu*, because the king himself is on board her, is under sail. She is given two square sails on her mizzen as well as on her fore and mainmasts, with the normal lateen on the bona-venture; it seems to have been more usual for four-masters to have lateens on both mizzens. Another painting of the *Henry*, believed to be contemporary, shows her with topgallant sails, but none of Volpe's ships has these. All, however, have bowsprits and spritsails, a recent addition to the rig of a fully masted vessel. The *Henry*, therefore, may be presumed to have had a ten- or perhaps a twelve-sail rig. Three-masters of the future were to have thirty sails, but she was a big advance on the round ship of fifty years earlier.

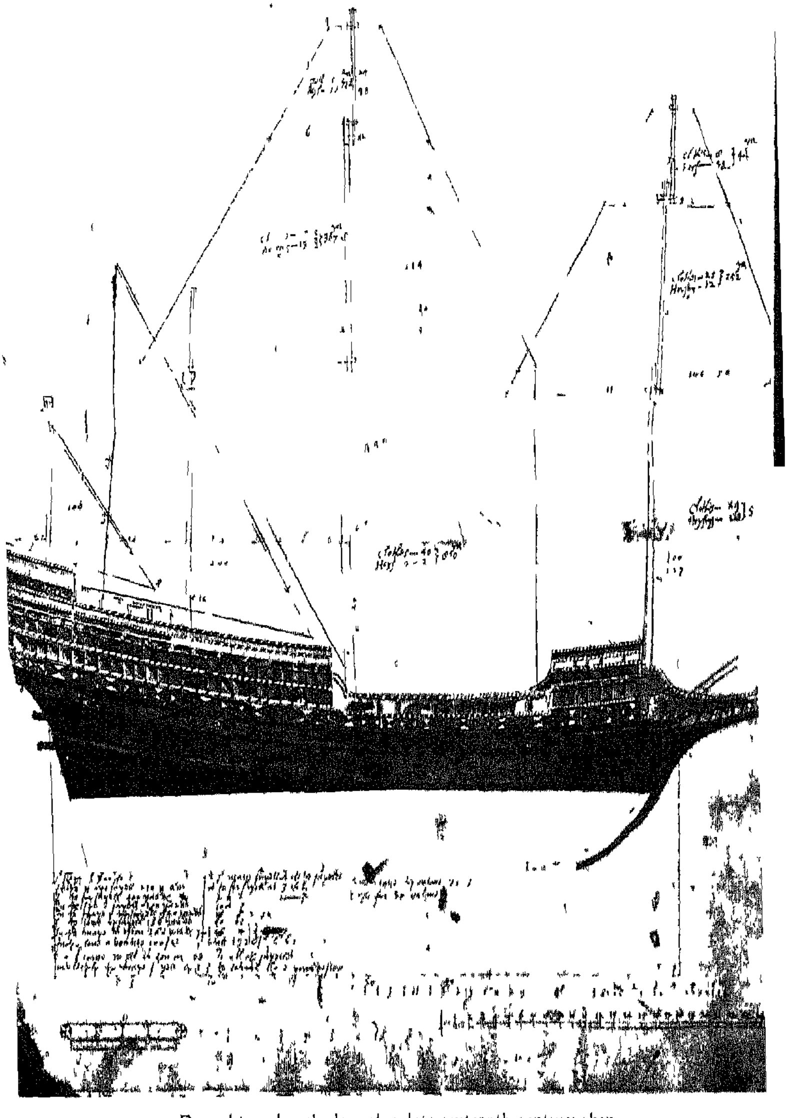
She was a very big vessel for her class and time, being in modern terms of perhaps 1500 tons burden. In Volpe's picture her great superstructure aft, gaily painted, is exaggerated beyond its real height, but this, in the carrack, was always lofty. Carried forward to the mainmast, covering the area later to be taken up by the quarterdeck and poop, it left only a small waist before a similar though smaller castle rose in the bows. From the square end of this projected the bowsprit; the beakhead was to come in with the improved type of carrack, the galleon. Beneath the *Henry*'s after castle the stern of the hull proper is cut square, following the horizontal beams across the stern-post and therefore known as a transom stern. It has two gun-ports, and an uncertain number are spaced along the ship's side.

Naval historians are inclined to belittle the *Henry Grace à Dieu*,

considering her unwieldy and overgunned. In the then state of naval architecture, smaller, handier and faster fighting ships soon became the rule, but in her day the *Henry* was said to be the best sailer in the fleet after the *Mary Rose*. The fact that she carried thirty or forty big guns does not mean that she had that number of ports for them. Some of her artillery, mostly built-up pieces, lay in her hold. Built-up guns gave endless trouble; chambers blew out and the weak barrels burst, and there had to be replacements at hand. For another reason, neither the *Henry* nor any other big ships of her time could show anything like a full broadside battery. They had no continuous gun-deck.

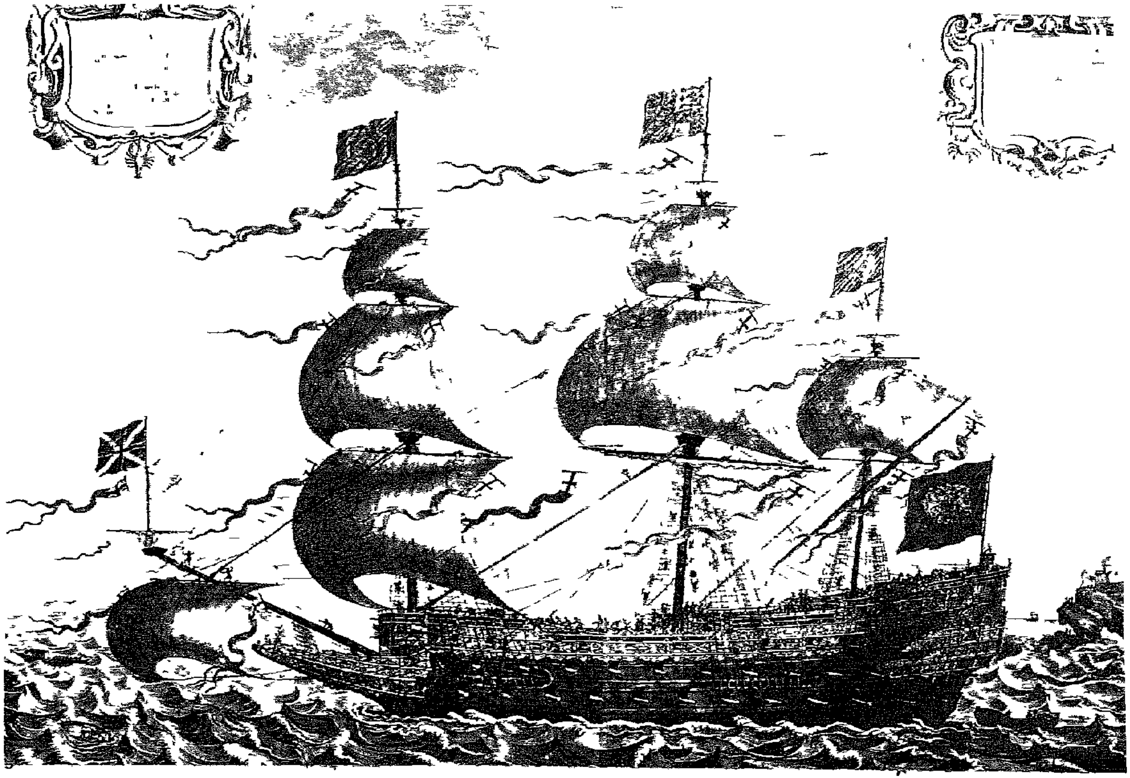
Very stout timbers called wales, from the uppermost of which we get the term gunwale, ran along the beam of all large vessels to give longitudinal strength to the hull. This feature is clearly shown in a picture of a three-masted merchantman of about 1530 in a window of King's College Chapel at Cambridge. From the hull the wales projected slightly in a shallow curve, rising towards the bow and stern. Decks, of course, did not follow this curve, and when the Tudor shipwrights had to make gun-ports they found that with a level deck they would have to cut into the wales. They were afraid of weakening the ship, and gun-decks, accordingly, were stepped. A tier of ports would be at different levels—two or three descending as the wale dipped from the stern, then perhaps a central group in line, and a third rising with the lift of the wale towards the bow. It seems improbable that this inconvenient arrangement was considered necessary in the smaller classes of warship in Henry VIII's fleet, and drawings of English galleons of the Armada period give no indication of stepped gun-decks; but it was not until the early years of the next century that shipbuilders dared to put continuous gun-decks into first and second rates, to employ terms then coming into use. Adam Willaerts's painting of the *Prince Royal* in 1613, in the National Maritime Museum, shows clearly her stepped gun-ports; in a later painting, thought to be of the same ship after rebuilding, she is given continuous decks.

By one account, the *Henry Grace à Dieu* was at some time given a second gun-deck to carry light guns, presumably demi-culverins. On the other hand, she appears to have been rebuilt in 1536, a process (of which there will be more to say) that in her



Draught and sail plan of a late sixteenth-century ship

From Fragments of Ancient English Shipwrightry *in the Pepysian Library*



The *Sovereign of the Seas*, 1637

From a coloured line engraving by J Payne

case reduced her burden from 1500 to 1000 tons. She is said to have been destroyed by fire at Woolwich in 1553, and in this connexion a most interesting discovery has been made in recent times. In 1912, building excavations at Woolwich near the Steamboat Pier, where there may once have been a creek, unearthed the timbers of a big wooden ship. Those that were sound were sold and cut up, but not until they had been examined by nautical archaeologists; and after prolonged controversy some who at first maintained that the ship was no more than a hundred and fifty years old were converted to the belief that she was very much older, and that the timbers might well in fact be the remains of the *Henry Grace à Dieu.**

5

In his reign of thirty-eight years King Henry VIII, starting from scratch, acquired or built a fleet of over ninety gunned ships. He inherited from his father at least two of 600 tons, and in his early years he bought and converted a 900-ton carrack from Lübeck and two of 700 tons from Genoa. He had fourteen others of between 400 and 500 tons. At the bottom of a list headed by the *Henry Grace à Dieu* came rowing barges of 20 tons, pocket galleys with a gun or guns mounted in their bows.

The first big-gun ships laid down, in the year of his accession, were the *Mary Rose* of 600 tons and the 450-ton *Peter Pomegranate.* (The pomegranate was the badge of Catherine of Aragon.) Of all his large fleet, only the *Henry Grace à Dieu* and the *Mary Rose* are remembered—the latter because of her fate. With his grandiose ideas, it was natural that after a fairly modest beginning the young king should decide to startle the world by building what would now be called a super-battleship. After 1514, however, it is noticeable that Henry or his naval advisers reverted to the smaller type of man-of-war. During the rest of his reign only one of over 500 tons was built in an English shipyard. It seems doubtful whether any in the fleet, except the *Henry* and perhaps the converted foreign carracks, had two gun-decks. This trend was to continue to the end of the century under Elizabeth I.

Henry's navy, like the cannon that armed it, suffered from a

* *The Mariner's Mirror*, Vol. 45, No. 2, May 1959.

plurality of types, or at any rate of names. To add to the confusion, the names are interchangeable. Anything with oars or sweeps, regardless of tonnage or rig, might be termed a galley, a galleasse, a bark, or just a ship. To try to simplify once more, the new navy had three main types. The carrack and galleon, *anglice* 'great ship', relied wholly upon sail. Galleasses, though fully rigged and often of considerable size, had auxiliary sweeps; coming from the Mediterranean, when employed there as fighting ships they led the galley squadrons to break up or disorganize the hostile galley formation, rather as modern tanks prepare the way for the infantry on land. They were a misfit in northern seas, where their long heavy sweeps can scarcely ever have been used, and they did not last in the English navy. The same Mediterranean influence may have caused Henry to include in his fleet the third type, a variety of small oared craft approximating to the galley. During the indecisive fighting with a French fleet at Spithead in 1545, the showy but fruitless part played by Admiral d'Annibault's galleys in those sheltered waters led Henry to order the construction of a full-sized squadron. But with England the galley was not to last either.

The fact was, while the new navy had gone ahead, naval tactics had not moved with it. Henry and his admirals, who were soldiers, not sailors, were still groping in the dark. For convenience' sake, the term 'battleship' has been used, but it means a ship fit to lie in the line of battle, and as yet there was no line of battle. Nobody had any real idea of how to employ the novel weapon of a heavily armed sailing fleet. The knowledge was only beginning to be acquired in the second half of the century, by the seamen of Elizabeth.

But if Henry and his admirals did not know how to handle his navy, a navy it was, the first in the world of the modern type. It was a true navy in another sense that was also new. Henry VII had appointed officials to administer his personal fleet in his personal interests. His son saw the fleet as a national possession and asset. Its growth called for more dockyards; in the Thames, docks were built at Woolwich and Deptford, and a dry dock at Erith, and there was a second dry dock at Portsmouth big enough to take the *Henry Grace à Dieu*. Then, two years before Henry died, the whole administration of the navy was put on a proper

footing. Letters Patent established a Navy Board, whose members were paid regular salaries by the Exchequer, and a separate Master of Ordnance of the Ships. Since then there has always been an Admiralty Department and Board in various forms. In the last century the collective powers of the Board were concentrated in the person of a civilian Cabinet Minister, the First Lord.

It is upon the Royal Navy, says the Preamble of the Act for its Government, that, 'under the good Providence of God, the wealth, safety and strength of the kingdom chiefly depends.' The kingdom being an island, the truth of this maxim has for so long been taken for granted that only naval historians remember how that navy came into being. It did not just grow, like Topsy in *Uncle Tom's Cabin*; it was the creation of a single far-seeing man; and it is time that in this respect King Henry VIII was given his due.

CHAPTER THREE

Progress Before the Armada

1

IF the Spanish Armada had come up the English Channel fifty years earlier than it did, it would have been sailing in a definite fighting formation which could be adapted to every foreseen contingency when battle was joined. The Spaniards were the first to evolve such a formation for sailing ships armed with heavy broadside guns. Their tactics were based on a complete misconception of how broadside fire should be used; clinging to medieval notions of a fleet action, they saw the big gun merely as another auxiliary weapon to pave the way for boarding parties. Having gained the weather-gage, the battle line was to advance upon the enemy, ship for ship, battering away and causing alarm and despondency until the moment came to close and board. Even a bad plan, however, is better than none; and in a general action with a Spanish fleet, that of Henry VIII, though in most ways superior, would have been at a disadvantage, its own commanders' ideas about tactics in the new conditions of naval warfare being still in a state of flux.

By the time the Armada actually came this situation was reversed. Spanish tactics in 1588 were virtually what they would have been in 1538. The English, in the meantime, had grasped the main principles of warfare based on the proper use of the heavy broadside gun. Naval actions at the beginning and end of Henry VIII's reign show that in thirty years his admirals had at least learnt enough to discard out-dated methods.

The traditional enemies of England were not then the Spaniards, but the French and the Scots. Henry's fleet supported several ineffective invasions of Scotland; and when, in 1542, he formed a pro-English party from among the Scottish nobles taken prisoner at Solway Moss, it was again his fleet that enabled this faction to hold Edinburgh Castle until his death. This was amphibious warfare—a matter of landing supplies and raiding parties. The Scots having no navy, there were no big actions at sea.

The French, on the other hand, had a fighting fleet of the popular mixed kind (big ships with big guns, and squadrons of galleys) based on their Channel ports. Inspired by Henry's example, they seem soon to have created a small nucleus of a regular sailing navy, but most of the big ships were armed merchantmen. The galleys, always in commission, often under hired foreign officers highly trained in their specialized tactics, were considered the navy's *élite*.

Three years after Henry came to the throne, he was at war with Louis XII of France. There was a naval action in the Channel in 1512. Galleys seem to have played little or no part in it. The *Regent*, from the previous reign, grappled the flagship of the French admiral, Portzmoguer; while boarders tried to scramble across, the broadside guns, their muzzles touching the ships' sides, set both on fire; powder blew up, and the two vessels sank together. They were packed with soldiers, and the whole affair was thoroughly medieval.

So was the suicidal exploit of Henry's Lord Admiral, Sir Edward Howard, in the spring of 1513. It was learnt that an experienced galley commander, Prégent de Bidoux, was bringing his squadron from the Mediterranean to join the French Fleet at Brest. Prégent was a Knight Hospitaller from Rhodes, and the English, aided perhaps by some confusion of thought, mispronounced his name as Prior John. Howard sailed to intercept him, but was too late. He kept his fleet off the port, but the French did not come out, and Prégent took his galleys into a small bay, drawing them up in line abreast in shallow water between two fortified islands. According to one story, which is at least characteristic of an era already vanishing, Howard invited his young king to join the fleet; sharply rebuked by the Council for suggesting 'putting the King in jeopardy', in a fit of pique he threw his life away in a hopeless enterprise. With the few oared craft he could collect, none of them bigger than a row-barge, he dashed at the line of galleys. With a handful of men he boarded Prégent's flagship; all were killed, and the rest of the flotilla was easily repulsed.

In 1545 England was again at war with France. Two actions between large fleets are notable alike for the complete abandonment of the tactics of thirty years earlier, and for the lack of any

to replace them. Knight errantry was as dead as the diplodocus, and no one so much as dreamt of boarding. The big ships never even came to close quarters, wasting the power of their broadsides in occasional games of long bowls. As for the French galleys, though they manoeuvred beautifully in the narrow waters of Spithead and impressed King Henry, who after a spell on board the *Henry Grace à Dieu* watched the engagement and issued orders from on shore, they were quite ineffective. A factor in these feeble affairs was no doubt lack of training among the crews of both fleets. The only ship lost by either side was the *Mary Rose*, which capsized off Portsmouth, a disaster attributed to the fact that her crew was not only untrained but insubordinate.

The second encounter, in the open sea, is of some interest for the glimpse it gives of the formation now adopted by a large fleet. All naval powers of the period borrowed military array and terminology. Fleets were even called 'armies'. An army marched with a van, a main body and a rearguard, which for battle were deployed as a right wing, a centre and a left wing. Fleets had their van, centre and rear squadrons, deploying in line abreast. The 'rear-ward' was sometimes composed of victuallers or troop transports, which kept behind the battle line, and occasionally it became a 'wing' of 'rowing-pieces' or galleys. The threefold division itself was to last, the squadrons in time being distinguished by the flags of their admirals—red for the commander of the central squadron, who was the senior and commander-in-chief, white for the admiral of the van, the vice-admiral, and blue for the junior of the three, the rear-admiral. These ranks, originally, like all naval ranks, temporary commissions which terminated with the ending of a command, persist today.

Both French and British, then, had a fixed order of battle by 1545. This was something; but the extreme caution shown by the opposing commanders in these two engagements is good evidence that neither knew what to do with it. The old ways were gone, but the new ones were still a mystery and a snare.

2

When a boy of ten succeeded Henry VIII, the Royal Navy numbered fifty-three ships, some twenty of them row-barges and other

small craft.* During the short reigns of Edward VI and Mary, the strength of the battle fleet remained at round about thirty. It had few chances of distinguishing itself, but in 1547, supporting in its amphibious role another invasion of Scotland, it made history by playing a helpful part in a land battle; its light-draught vessels aiding the English artillery to break the Scottish hedgehogs of pikes at Pinkie Cleugh. A contemporary account of the battle scarcely discriminates between the fleet and the army, referring casually to the fire of 'marine engines'.

The navy, however, was taking itself seriously. Henry VIII's Navy Board was there to preserve continuity of administration, and in his son's reign we hear of a firm line being taken with foreigners who failed to salute the flag. During Queen Mary's reign there were replacements and some rebuilding of ships launched in her father's later years. A second *Mary Rose* was to live to fight the Armada. When Elizabeth I came to the throne in 1558, of twenty-eight or thirty ships carrying broadside guns, probably half were fifteen or twenty years old. The smaller classes of oared vessels seem almost to have disappeared.

At once there was increased activity in English shipyards. A big ship already on the stocks, the *Elizabeth Jonas* of something like 900 tons, was completed, and in the next six years fourteen more were laid down or purchased from private owners and converted. Among them were the *Triumph* and *White Bear* of about 1000 tons, and the *Victory*, the first of her name in the English navy, of 800. None of the others approached such tonnage. This seems to have been a programme of replacement, and the rate of building was not maintained. Elizabeth's fleet was to include more purchases and some prizes, but she built fewer ships than her father did in his shorter reign; and when the Armada came the regular navy was little bigger than it had been thirty years earlier—thirty-four sail all told, including eight of under 100 tons. On the other hand, by then it consisted largely of ships of a new powerful type, or older ones brought up to date.

The queen was a mixed blessing to her navy. She inherited her father's interest in it, and circumstances were to make clear to her the fundamental truth which perhaps he only dimly recognized, that upon the navy the safety of her country did indeed chiefly

* M. Oppenheim, *History of the Administration of the Navy, 1509–1660*.

depend. Heroic actions thrilled her, and she could never hear enough of the deeds of her seamen. But she inherited also, from her grandfather, an equally keen interest in making money, and a reluctance to spend it. A navy was costly, and must do its best to pay for itself. When a syndicate financed a raid on some other country's possessions, she lent a royal ship or two because she could then demand a large share of the booty. Had the other country been England's old enemy, the queen could have indulged in these provocations with impunity, France, for the time being, having ceased to count as a naval power. But the victim was Spain, a very different matter; and, as other causes of friction multiplied, the seamen who raided the Spanish Main foresaw that sooner or later retaliation was inevitable, and it must come by sea. Elizabeth seemed unable to bring herself to face a fact that called for long term protective measures and a great expenditure of money. When at length the threat began to take shape, her constant changes of mind and injudicious economies were the despair of her naval advisers.

Happily for the country, they were a remarkable set of men, and within the limits imposed by the queen's frugality they had a free hand with the navy. In their filibustering cruises John Hawkins, Drake, Frobisher and others gained invaluable experience in handling squadrons of big-gun ships and in gauging the good qualities and defects of existing types; and these lessons began to be put into effect after Hawkins, in 1569, became virtually head of the Admiralty. The battle fleet had then sunk to twenty-five sail, of which five were of the large class now going out of favour. For another decade the total scarcely increased, but a number of old ships were replaced by new ones of a novel type, the 'middle-class', heavily gunned galleons that were to prove their worth against the Armada.

The galleon differed from the carrack in having finer lines, lower freeboard, a lower superstructure aft and a much lower one forward. From its relatively low waist it was spoken of as a galleasse-type. The outstanding feature of the 'middle-class' galleon, which Hawkins and Drake decided should become the standard ship of the line, was the very heavy battery it carried for its size. The prototype of this class, the *Revenge*, was completed in 1577. Of 500 tons, her armament was increased until in 1588

she may have mounted thirty-four broadside guns, twenty-two being demi-cannons, cannon-perriers, culverins and demi-culverins —that is, 32-, 24-, 18- and 9-prs. Her other twelve guns were sakers, long 5-prs. whose career was coming to an end; they were too weak to be effective broadside pieces. Most of these guns were brass. Of light anti-personnel weapons the *Revenge* carried only twelve in 1588.

The length of her keel was ninety-two feet, and her beam was thirty-two feet. With the overhang of her high stern and the long beakhead that had now come in to break the seas as a ship pitched, her overall length must have been above a hundred and thirty feet, and the extreme proportions of her hull about 1 to $3\frac{1}{2}$, approaching those of the frigates of the future. She had four masts, protected tops for musketeers, topmasts that could be struck, and a bowsprit with a spritsail raking up from the beak-head almost like a fifth mast. Smaller than the smallest frigate, the 9-pr., 28-gun class, the *Revenge* threw much the heavier broadside. She may have had six demi-cannons, which can be treated as the 32-prs. they became. In time they were carried only in ships of three times her tonnage.

The *Revenge*'s very mixed main battery, down to demi-culverins, was common to all warships of her day. What the little sakers were expected to do is not clear—probably they were retained for close-range fighting as anti-personnel pieces. Fleet actions were now to be gunnery battles, and with boarding as a tactical aim a thing of the past, the weak little serpentines and their like were useless; and after steadily reducing the numbers mounted on ships' bulwarks, in 1585 Hawkins made a final clearance, sending hundreds of them back to the Tower.*

3

The *Revenge* was to become famous, first as Drake's flagship, when he was second-in-command against the Armada, and then for her last fight, under Sir Richard Grenville, at Flores in the Azores in 1591. Granted that Spanish gunnery was poor, it was her heavy battery that enabled her to fight on against a succession of great ships twice and three times her size and nominal force

* M. Oppenheim, *History of the Administration of the Navy, 1509–1660.*

throughout a long afternoon and evening, and to damage them as badly as she did. Drake, the great advocate of gunnery, gave her more guns than her sister ships carried, but all had powerful batteries for their size.

The *Revenge* is thought to have had a continuous gun-deck, on which was the whole of her main battery. Her guns were without sights, aiming being effected by an instrument called a gunner's quadrant, and loading, aiming and firing was a slow process. The gun-deck was completely covered by the deck above, from which the ship was worked—not, as in later single-decked ships, open in the waist. It was very low, as it was to remain, and a tall man had to duck under the cross-beams overhead. Gun-ports were no more than two feet six inches square. The portsills were probably four to five feet above the water. If there is truth in the story that the first big-gun ships had them too low, and that the *Mary Rose* was lost from this cause, the error would have been corrected.

The crew slept on the gun-deck, on the boards, hammocks not being introduced from the Caribbean until the very last years of the century. Henry VIII's ships had more soldiers than seamen; the *Revenge* carried seventy-six soldiers, to whom may be added twenty-four artillerymen, the gun-captains, but her crew numbered a hundred and fifty. Being Drake's ship, her officers must have been an experienced body of men; there was then, however, no distinction between officers of the regular navy and those of the merchant marine.

When the ship's ports were open, the guns and their bulky carriages did not admit much daylight to the gun-deck. With the ports closed, and after dark, the crew groped about between decks by the light of the 'purser's dip', a tallow candle in a horn lantern. After whale-oil lamps came into common use, they were for long thought too dangerous on shipboard, except for mast-head lights and stern lanterns. The ship chandler now sells all kinds of marine stores, but the name goes back to the time when enormous quantities of candles were required by ships; and the records of a very old firm of candle makers show that it had to work at high pressure to meet the navy's orders when the Armada was on its way.* Few contemporary drawings of Elizabethan

* Messrs. J. C. & J. Field.

warships give them poop lanterns, but the *Revenge* certainly had one, for Drake was censured for extinguishing its light while leading the fleet off the Isle of Wight. These lanterns were very large, since in smaller ones the bunch of big candles carried would melt by their own heat. The biggest of the five on the poop-rail of the *Sovereign of the Seas*, built sixty years after the *Revenge*, held ten men standing upright.* Pepys with five ladies, in the bulky skirts of the time, and two maids, climbed into it in 1661. Three became the normal number, because when a ship was seen bows-on the light of a single central lantern was obscured by her masts.

A few simple night signals could be made by hoisting lanterns to the yardarms. Signalling by flags in day-time was almost as elementary; by flying flags in certain positions an admiral could summon captains to the flagship, or order the fleet to anchor, or to form line ahead or abreast, but there was not much more that he could do. The system known to seamen of Nelson's early days had not greatly advanced, for only in 1782 was a signal book compiled giving a numerary code by means of which precise and elaborate instructions could be composed, and even personal or inspiring messages—for example, Nelson's own Trafalgar signal.

A veteran of that battle would have been amused to find that the *Revenge*'s equipment of small arms included not only matchlock muskets, otherwise harquebuses or hackbuts, so heavy that they were fired from forked rests or laid over the ship's bulwarks, but also long-bows and sheaves of arrows. He would have been surprised by her four masts, and by features of her rig. The lateen yard with its triangular sail was still in use in his time, and the yard continued to be fitted on big ships until about 1800—the *Vanguard*, Nelson's flagship at the Nile, carried one—but by then the forepart of the sail had been cut off. Small ships had been given gaffs. The *Revenge* had, of course, no jibs, staysails, or royals. Studding-sails were almost due to appear; to increase sail area, or to reduce it, she made use of bonnets—narrow strips of canvas laced to the foot of the fore and main courses. These big sails had buntlines and leechlines for furling, but at sea this

* R. C. Leslie, *Old Sea Wings, Ways and Words* (1890, Facsimile Edition, 1930).

was effected by lowering the yard to the deck, and in a temporary anchorage by gaskets—loops of rope passed over the yard. Topsails were always lowered for furling. In general the controlling gear, the running and standing rigging, was very much that of the square-rigged ship of today. The imagined visitor from 1805 would notice that owing to hoisting problems, or to the cramped waist, only the *Revenge*'s small boats were stowed there; the heavy thirty- or forty-foot long-boat was towed.

Besides the bows and arrows, one other touch of the Middle Ages survived in Elizabethan ships—the crude, bright painting in primary colours of their prominent upper works. Expensive gilding had yet to come. Beneath the surface they were essentially modern. Among many improvements introduced by Hawkins perhaps the most important was a process of sheathing, a layer of hair-felt and tar between elm boards, which at least reduced the destructiveness of that implacable enemy of wooden ships, the boring worm. It was to remain in use in the navy almost up to the days of copper sheathing.

The Trafalgar seaman would have found Drake's flagship weatherly and a fast sailer. He would probably have considered her overgunned. The shortness of her keel in proportion to her overall length caused her to pitch in a sea, but it made her very nimble when coming about. All in all, having got used to a few anachronisms, the visitor would have had little to learn or to forget in handling and fighting the first *Revenge*.

CHAPTER FOUR

The Armada: The Fleets

1

UNTIL the last quarter of the sixteenth century, Spain, as a naval power, looked towards the Mediterranean and to its new possessions across the Atlantic. To these, after the conquest of Portugal in 1580, were added more in the East Indies. At that date northern European waters interested Philip II mainly as a supply route to the Spanish Netherlands; and he was still almost as reluctant to be drawn into war with England as Elizabeth I was to go to war at all.

Conventions, not unknown today, might permit military action without the formal existence of a state of war. The murder of William the Silent led to the dispatch of an English force to aid the rebellious Netherlanders; and raids by English seamen in the Caribbean, and even in the Pacific, had long been a recurrent irritant in the relations between England and Spain. Nominally, however, those relations remained peaceful, if scarcely friendly. Leicester's ill-trained troops were mercenaries, and Queen Elizabeth, having taken her share of the raiders' booty, disowned them. Philip pretended to believe her; but by 1584 he had decided that an end must be made not only to piracy, but to the whole heretic régime that encouraged it.

The most slow-moving and cautious of men, he was then in no hurry. He would bide his time. Yet if any one event can be said to have brought war within sight, it was a precipitate act of reprisal authorized by himself. In the summer of 1585 a number of English merchantmen, sailing under safe-conduct, were seized in Spanish ports. The retaliation that promptly followed made the offence seem mild. Drake put to sea in September with a squadron that included two ships of the Royal Navy, and having raided the Spanish mainland at Vigo, swept through the West Indies, capturing and plundering city after city. Cartagena, the capital of the Spanish Main, was held to ransom, and on the

homeward voyage a small Spanish settlement in Florida was rather wantonly wiped out. In terms of modern money, the cruise may have netted a million and a half in ransoms and pure loot, and enormous material damage was done to fortifications, property and shipping.

This was not just another raid; it was a full-scale offensive, and its effects upon Spanish prestige and credit were calamitous. For a year past leisurely preparations for the 'Enterprize of England' had been in hand in Spanish ports, and knowledge of them was Elizabeth's reason and excuse for letting Drake loose in the Caribbean; but had she kept him back, as she nearly did, they might have dragged on for years, and possibly come to nothing in the end. The commanders-designate for the invasion of England were Spain's leading seaman and soldier—the Marquis of Santa Cruz and the Duke of Parma. Santa Cruz considered the 'Enterprize' practicable, though he wanted a far bigger force than eventually sailed, but he was to die before the Armada was ready, and his successor was much less hopeful. Parma, waiting in the Low Countries with a part of the army of invasion, after at first professing faith in the plan, seems soon to have had second thoughts. But with Philip stung out of his procrastinating habits, the preparations for the great design were hastened, and there was now a firm determination behind them.

Parma was in a far better position than his king at Madrid to appreciate the difficulties. He had a large army in the Netherlands, but at least two-thirds of it would have to remain there, and his Spanish veterans, upon whom he relied, numbered less than nine thousand. The fleet from Spain would have to bring heavy reinforcements. And what was to happen when it arrived? The obstacles then to be overcome were precisely those that were to baffle later would-be invaders of England. It was all very well to collect, as Napoleon and Hitler were to do, flotillas of flat-bottomed barges; but could the fleet protect them while they were crawling, packed with soldiers, horses and guns, across the full width of the Straits of Dover? It is unlikely that Parma had any real hope of the Armada gaining permanent control of the fifty miles of water between Dunkirk and the Kentish coast. Six years in the Low Countries had taught him much about the command of the sea. English captains patrolling from the Straits to the

mouths of the Schelde, who seldom saw a Dutch ship, complained bitterly that the Hollanders were doing nothing, but the Duke knew better. Every port at his disposal was blockaded by small shallow-draught vessels that swarmed in the channels behind the Zeeland Banks. Nor had Parma any illusions about the English navy. Of its fighting and sailing qualities he had ample information.

That it was a navy of a new type had long been known at Madrid, but the homeland of Spain was living in times past. When disaster in the Caribbean caused the 'Enterprize' to be pressed forward, it was too late for material reforms in outdated naval methods. One change that Philip had time to effect was typical of these. Still believing or hoping that the fast English ships would come within close range of the slow Spaniards, when they might be so battered and wrecked aloft that they could be boarded, he greatly increased the numbers of the Armada's heavy short-range guns.* It was Philip himself, it should be noted, immured among his piles of documents in the Escorial, but delegating nothing, who saw to such things; and it is fair to add that he was sometimes more realistic than his admirals. It was he again, after galleys had shown their helplessness against well-handled ships during Drake's destructive raid on Cadiz, who laid it down that the Armada, which then had forty galleys on its strength, was to sail without them.

2

The Cadiz raid was the second of two events occurring in 1587 that gave a decisive jog to the still deliberate preparations for the 'Enterprize'. In February the Queen of Scots had been executed at Fotheringhay. Her heretic rival was excommunicated, and the papal blessing and a papal banner were bestowed upon the great fleet that was to bring England back to the Faith. A military operation had become a crusade, the hope of Catholic Europe, and to the King of Spain, the favourite son of the Church, a sacred duty. Then, to more exalted motives a personal incentive was added, and the 'singeing of his beard' in Cadiz harbour, by rousing Philip to one of his very rare outbursts of anger, revealed

* Michael Lewis, *The Spanish Armada* (Batsford, 1960).

his human side. The insult was too great to be borne, and the stream of orders from the Escorial became imperative. There must be an end of sloth and excuses. The Armada must get to sea.

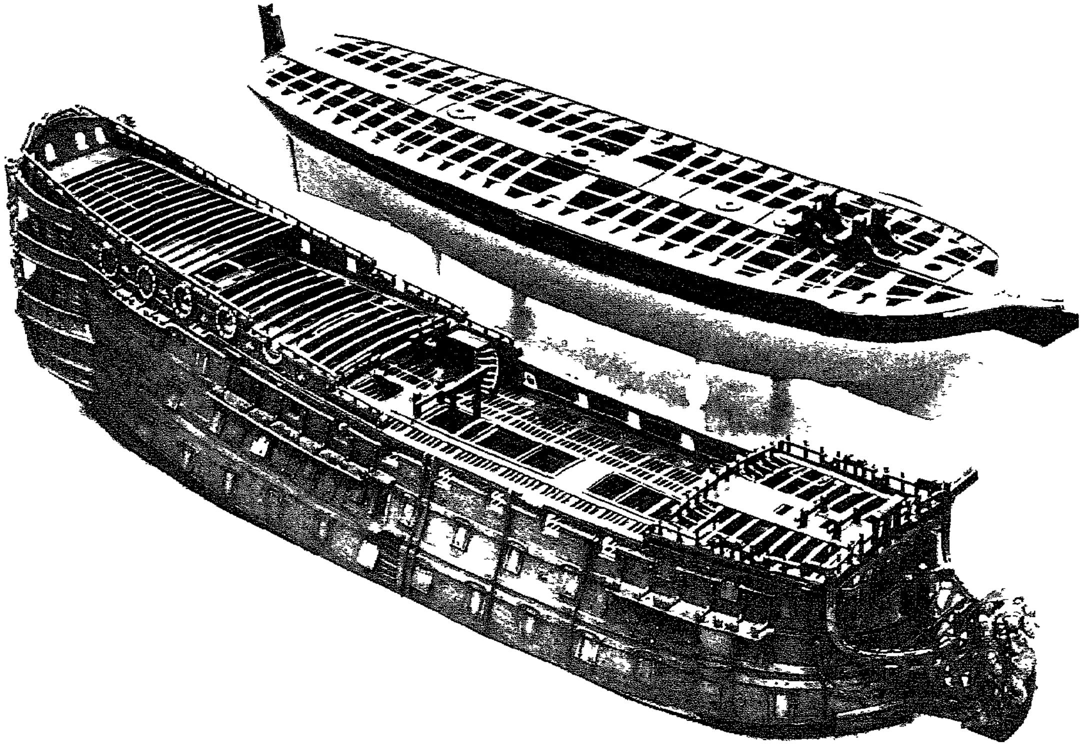
But the raid was the cause of more delays—in part by the destruction of transports and victuallers, and then through Drake's subsequent seizure of the port of Sagres, by Cape St. Vincent. From this base fearful havoc was wrought among the fleets of small coasters bearing cargoes indispensable to the Armada, such as coopers' stores, particularly seasoned barrel-staves. Then, and for long after, ships carried everything in casks—water and wine, salt meat and fish, and gunpowder—and the wood for the casks had to be seasoned. It has been suggested that this far-sighted strategic move, with which the Spaniards made no attempt to interfere, was as harmful to the Armada as the loss of its transports at Cadiz.*

A yet worse blow was to come. Early in the New Year, that fateful year, 1588, Santa Cruz died—the only Spanish seaman whose reputation was such that the arrogant nobility serving with the fleet in subordinate commands would consent to obey him. This virtually limited the choice of his successor to a grandee of the highest rank, whether or not he knew anything about the sea. The appointment went to the Duke of Medina Sidonia, whose protests that he was quite unfit for the post were overruled.

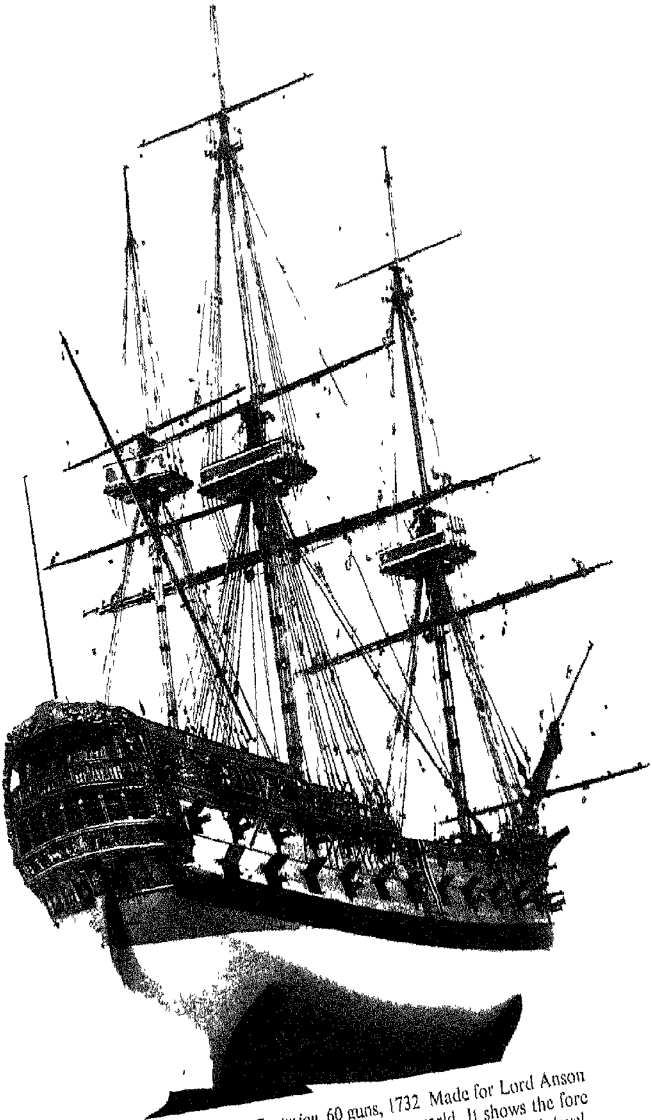
During these last stages of preparation for the great design, Philip redoubled his own labours to oversee a thousand details that even he had been content to leave to the experienced Santa Cruz. The result was not the same, but though food went bad, and stale water brought dysentery, within three months of the old admiral's death Philip decided that the Armada was as ready for sea as it would ever become while it stayed in the Tagus, where it had assembled, under its new commander. Sidonia was ordered to take the first fair wind.

According to the Julian Calendar, or Old Style, to which we obstinately adhered for another hundred and sixty years, it was on 18 May that the largest fleet ever got together in one anchorage until the days of Scapa Flow, weighed and put to sea. Some of the big ships, however, were soon so short of water that the duke

* Garrett Mattingly, *The Defeat of the Spanish Armada* (Jonathan Cape, 1959).



The *Britannia*, 100 guns, 1719. The model has been taken apart to show the structure of the lower or main gun-deck and the rid-ing bitts to which the anchor cables were secured. Compare the open waist with that n Dighton's painting of the *Victory* (facing). 83), whose waist s almost completely lecked in



Model of the *Centurion*, 60 guns, 1732. Made for Lord Anson after he had sailed in her round the world. It shows the fore and main channels or chain-plates raised to quarterdeck level, the result of Anson's experience in rough weather during the long voyage

took them into the sheltered haven between Ferrol and Corunna. A westerly gale scattered the rest. More than two months went by while they gradually rejoined. The Galician countryside supplied fresh victuals. Crews were rested, and sick or dead replaced. On 12 July a reinvigorated Armada finally sailed on the enterprise for which the whole Christian world was waiting.

Four Portuguese galleys, which had slipped away with it, and one galleon, turned back. This left a total of a hundred and twenty-five sail. Rather more than half were accounted fighting ships—ten from the Royal Portuguese Navy, ten galleons of the Indian Guard, four from the *Flota* of New Spain, four Neapolitan galleasses, and forty-one big merchantmen. These last, though some of them were among the biggest ships in either fleet, were far from being in the capital-ship class; so that in a battle fleet of sixty-nine sail, only the twenty-eight first mentioned —the Portuguese, the galleons of the Indian Guard and the *Flota*, formed to protect the precious transatlantic trade, and the galleasses from the Mediterranean—were true men-of-war.

The English have naturally cherished their own illusions about the two fleets that were now to meet. The picture persists of huge Spanish ships towering above their small opponents. Modern research has unkindly shown that the truth is rather different.* Impressions at the time were coloured by the fact that the Armada galleons were old-fashioned, tall-sided vessels, with lofty forecastles and poops, while most of the English ships were of the new single-decked type, low in the waist, their forecastles little higher than those of the eighteenth-century navy. The term 'galleon' itself, being usually applied only to the Spaniards, has come to mean bigness. A further cause of error, that was to perpetuate confusion throughout the age of sail, was the difference between British and Continental methods of calculating tonnage. By Spanish reckoning, Medina Sidonia's flagship, the Portuguese *San Martin*, was a ship of 1000 tons, but by ours of no more than 750. A resulting inference, shattering to the centuries-old belief that gallant little craft were victorious against great odds, is that in the battleship class the biggest on either side were our own 1000-ton *Triumph* and *White Bear*. Taking this class as a whole, however, the sixteen largest units in the Armada

* Michael Lewis, *The Spanish Armada*.

probably had an advantage in combined tonnage over the similar number of our royal ships that bore the brunt of the early fighting; and in the case of the opposing auxiliaries the disparity was much greater. There were a dozen big merchantmen in Sidonia's battle line of round about 1000 tons by Spanish measure.

Behind the battle line, where in action they were stationed, were twenty-five *urcas*, or store-ships. Some thirty small craft were used chiefly as dispatch-vessels, in constant demand when signalling was in a primitive stage.

The names of artillery, mostly of French origin, being international, the Armada had its cannons, perriers and culverins. Its non-combatant vessels being armed with light weapons, it carried two thousand four hundred guns of all types. While popular belief has insisted on the great size of its ships, British naval historians, on the other hand, were for long equally convinced that these ships were undergunned. The most recent authority has shown that this also is an illusion.* Philip having greatly increased the proportion of heavy guns in the battle fleet, the armament of its sixty-nine ships included perhaps a hundred and sixty cannons and demi-cannons (50- and 32-prs.), no fewer than three hundred and twenty-six cannon-perriers (24-prs.), and three hundred culverins and demi-culverins (18- and 9-prs.)—about seven hundred and ninety in all, or rather more than eleven per ship of these types, the battering guns of the time. The percentage was much higher in the twenty-eight men-of-war. It seems probable that the fighting ships would take the lion's share of the three hundred and thirty light 5- and 4-prs. distributed throughout the Armada. The balance of thirteen hundred 'guns', making up the total of two thousand four hundred, were serpentines and the like, little anti-personnel weapons mounted as swivels. Their turn was to come in the final stage of boarding and entering which was still the aim of Spanish tactics. It has been seen that the English, having no intention of waiting to be boarded, had all but cleared their decks of these popguns.

For the Armada's heavy artillery Philip had scoured Europe. In Kipling's 'Hal o' the Draft', Sussex iron-founders are selling guns to Scottish pirates, but when the author wrote of 'the guns that smote King Philip's fleet', perhaps because he was a Sussex

* Michael Lewis, *The Spanish Armada.*

man by adoption he did not add that King Philip smote back with cannon from the same source. English gun-makers had a high reputation, and in Spain their products fetched not only a correspondingly high price per ton, but even pensions for manufacturers so unpatriotic as to smuggle them over. The Armada had many English guns.

For several reasons, however, its considerable fire power was to prove more nominal than real. There were far too many guns of the wrong type for the occasion, fourteen per cent being short, and therefore short-ranged, heavy-shotted cannons, and another twenty-nine per cent the still shorter perriers or *pedreros*, 'smashers' like the later carronades, with a very limited range indeed. Then Spanish gun-ports seem to have been too small, restricting arcs of training and of depression and elevation. Finally, Spanish gunnery was, at its best, indifferent and often downright bad.

Unlike the English navy, which was now a professional service, officered by veteran seamen, Spanish fleets were run like armies, by soldiers. Soldiers commanded squadrons and individual ships. Many of them had much sea experience, but one and all were nobles and looked down on the masters and common sailors to whom they issued orders. Cervantes, who had served at sea—he was at Lepanto—has drawn in *Don Quixote* a kindly caricature of the most rigid caste surviving in Europe. Arrogant, romantic, quarrelsome, rashly brave and adventurous and often brilliant leaders, its members still thought of warfare in terms of the Middle Ages. The sword and lance were a gentleman's weapons; hackbuts and pistols were for men in the ranks, and artillery was a degraded and degrading arm. Now, unhappily, a necessity on a ship, the true purpose of guns was to prepare the way for boarding and hand-to-hand fighting, and it was not for a man of noble birth to learn how to work and fire them, still less to train others in their use. Modern research, again, after destroying long-held illusions about the Armada, shows that its gunnery branch was a self-contained unit, whose officers were so low in the social scale that there was 'not a Don among them'.* Dons and hidalgos crowded the quarterdecks, but the gunners down below, who alone in the whole great fleet stood for the realities of the new

* Michael Lewis, *The Spanish Armada.*

warfare, were despised and neglected. With powder and shot for four days' fighting, the Armada was thought to be amply provided. Practice with live ammunition was still almost unknown; gunnery practice was limited to going through the motions of loading before running the gun up to the port, and on Spanish ships there was little of even this elementary drill.

Besides gunners, their normal complement included a far higher proportion of infantry soldiers than was now the English practice. The Armada was also conveying a powerful reinforcement for Parma's army of invasion. Altogether it was carrying nearly twenty thousand troops, the pick of them the best in the world. As ignorant as most of their commanders of what lay before them, they were eager for a chance *en route* to do something more than clutter the decks. It may have occurred to Medina Sidonia, who was not hide-bound by military theory, that if the English sought battle in the Channel, or the Sleeve, as they still called it, their well-known sailing qualities might render vain injunctions to make every effort to board; but the Duke entertained a more confident hope that the Armada would reach the Straits without serious fighting. He was mistaken, and though it shouldered its way through it was at so heavy a cost in damage and morale that it had become a spent force and a prey to panic.

3

On that 12 July, a Friday, when the Armada finally put to sea, to most of the thirty thousand men on board, no less than to the crowds watching and praying on the cliffs of Corunna and Ferrol, it may have seemed that it was rightly named the 'Invincible'. There were those in England who feared the same. The country had a long history of invasions, many of them successful. The queen's grandfather had won the throne with a small mercenary army shipped from the Continent. England had no regular troops, and in spite of her seamen's exploits there was little understanding of naval power. In the experience of the English it had never stopped an invasion yet. Nor were the days of waiting without grave anxieties for the men who commanded the Royal Navy; they believed that they could deal with the Armada, given fair conditions, but much depended on the weather, and scarcely

less on the queen's whims and the fears of her counsellors. All these contingencies were to upset the seamen's plans.

Lord Howard of Effingham had been appointed Commander-in-Chief when the navy and its auxiliaries were mobilized in the late autumn of the previous year. The thirty-four Queen's Ships were then reinforced by no fewer than a hundred and sixty armed merchantmen, lent, hired or requisitioned. Howard had some experience of the sea, but it is generally assumed that he leaned heavily on the advice of Drake and Hawkins. The former he appointed Vice-Admiral, and Hawkins left his office at the Admiralty to become Rear-Admiral. It was they who urged that the Armada should be attacked either at its ports (as had already been done at Cadiz) or immediately it left them, but the weather, and then the fears of the queen and her advisers, kept the fleet in home waters. The government also made the dangerous mistake, repeated by many governments since, of imposing its larger strategical ideas on the professionals. The latter wished to fall upon the Armada, wherever it was met, with every available ship, but they were overruled; while the main body of the fleet concentrated at Plymouth under Howard, a powerful squadron commanded by Lord Henry Seymour was kept in the Downs to watch Parma's embarkation ports, a task being efficiently carried out by the Dutch.

According to who the enemy is, the British navy adopts as a base one or more of several harbours on our long European coastline. The Thames estuary and Portsmouth were obvious bases when we were fighting the French; twice in recent times, the enemy being Germany, the main fleet has gone north to Scapa Flow and Rosyth. In 1588 it was the turn of Plymouth, a magnificent harbour admirably placed for a concentration against a threat from the Atlantic. Here, in that July, Howard had just over a hundred sail of all kinds. He flew his admiral's flag in the *Ark*, later the *Ark Royal*, a new ship of 800 tons, purchased from Sir Walter Raleigh. Drake was in the *Revenge*, and Hawkins in the *Victory*. There were another thirteen battleships ranging in size from Frobisher's 1100-ton *Triumph* down to the *Aid* of 250 tons. Smaller craft made up a total of twenty-three sail of the regular navy. It seems that of the numerous merchantmen only two were of 400 tons and perhaps thirty of 200 and upwards.

At Plymouth, Howard cannot have had more than a score or so that would be of the slightest use in close action. As the fighting rolled up the Channel other auxiliaries joined him. Of the part the merchant navy played in that fighting little is known. One could do with some information about the deeds of the *Bark Buggins*. Those that got into action appear to have acquitted themselves well, but all must have been weakly armed, many were undermanned, and their crews can have had little or no training in battle tactics or even in keeping station. One of the lessons of the days to come was that with the growth of a professional navy the day of the part-time warship was passing.

The armament of not even one of the Royal Ships is known with certainty. The sixteen may have had from twenty to forty-five guns in a battery. Approximate figures for the whole English fleet, at its final total of a hundred and seventy-two ships, are, however, available. Broken down into types, they make a most interesting picture when contrasted with those of the Armada.* Against the latter's hundred and sixty or so cannons and demi-cannons, the English may have mustered fifty-five, and perhaps forty-three of the perrier type against the Spaniards' three hundred and twenty-six. With culverins and demi-culverins, the long-range 18- and 9-prs., the position is quite different—to the Armada's three hundred, Howard's fleet had five hundred, though only about a hundred and fifty were of the larger calibre. Of the little 5- and 4-prs., sakers and minions, the English had the huge total of nearly fourteen hundred, the Armada a mere three hundred and thirty.

When both sides summed up the results of the fighting, they reached contrary conclusions about their artillery. The Armada had not enough long-range guns, the English fleet not enough heavy ones. At the ranges imposed by the latter, it is probable that 5- and 4-prs. were practically useless. They were no doubt mainly distributed among the merchantmen.

The imposing English total of a hundred and seventy-two ships means nothing. By far the greater part were little craft, no bigger than the Spanish dispatch vessels. As many of the auxiliaries in the Armada's battle fleet were larger than any of ours, while all were believed to be more heavily armed, Howard must have

* Michael Lewis, *The Spanish Armada*.

felt that everything depended on his sixteen regular fighting ships —as indeed was the case. Idling in the Downs, under Seymour, were five more, including two improved *Revenges*, the newest in the navy, together with fourteen smaller Queen's Ships. Seymour was to get into the fight at the end, but for the first six days the odds in battleship strength seemed heavily in favour of the Armada, with twenty-eight against sixteen. The galleons of the Indian Guard and the *Flota*, however, were merely merchantmen, always well-armed and on the whole with more reliable captains and better-trained crews than were to be found, as events proved, among the auxiliaries; they were not in the same class as fighting ships as the ten from the Portuguese navy and the galleasses. Sidonia soon discovered that he would have to rely upon this nucleus of fourteen, as Howard did upon his sixteen. With the latter's extra two, the odds were not very unequal.

CHAPTER FIVE

The Armada: The New Tactics

1

DURING the first half of 1588 such news as reached England of the Armada's state of readiness and movements, if any, was sketchy and confusing. It was coming—it was still in port—again it was on its way. When its first start, in May, was frustrated by gales, a part of it appeared off the Scillies, and then vanished. Had it gone to Ireland? With the queen's reluctant consent, Howard put to sea in June to look for the enemy, but he was blown back to Plymouth, his ships already in need of revictualling. A supply department had been in existence for forty years, but at this crisis the system broke down badly. The fleet was always short of food and ammunition.

It was again a Friday, 19 July, when a scouting pinnace brought the startling news that the Armada was off the Lizard. It seems to have been completely unexpected at Plymouth. A westerly wind was blowing almost dead into the harbour mouth, and with the enemy at hand, Howard had to begin warping his ships out. By the late afternoon of Saturday, the *Ark* with some fifty sail had got to the westward of the Eddystone Rocks, and through mist and drizzle the leading ships of the Armada were dimly in sight to windward. Its look-outs seem to have had a glimpse of the English at dusk, when the wind fell, and Sidonia ordered his ships to anchor.

Though the Armada had the wind behind it, its progress up the Channel had been slow. It was sailing in the usual three divisions, those to port and starboard being 'refused', to use a military term that would have seemed appropriate, to cover the victuallers following the central division. This was the fleet's fighting formation; the two squadrons of each division formed tight clumps, so that any ship attacked would have close support. To keep this formation, and because of the poor speed of the victuallers, the Armada was under reduced sail.

Its leisurely rate was a piece of luck for Howard. The story of Drake's game of bowls, adapted to show the cool nerve of Englishmen in a crisis, may have had a satirical origin. The Armada should not have been allowed to reach the Lizard undiscovered. But if Howard had not pushed his scouts far enough, he was now to make tactical amends for being caught napping.

Medina Sidonia had supposed that no more than a third or a half of the English fleet, under Drake, was in Plymouth Sound. Only a few ships were seen near the Eddystone on the Saturday evening before the Armada anchored. During the night the duke learnt from captured fishermen that Howard was at Plymouth. Some ships' lights were seen under the land, and the dawn of Sunday, the 21st, disclosed six or eight sail, obviously from the Sound, on the Armada's port hand. None were in sight ahead, and other ships beating out from the Sound confirmed the delusion that the mass of the English fleet was still in harbour. The way was clear, and the duke signalled the Armada to make sail. In an hour or two it would be past Plymouth.

And then, as the morning brightened, from the starboard division came agitated signals by flag and gun. Sidonia, looking back from the poop rail of the big *San Martin,* saw the south-western horizon, astern of his rearmost ships, alive with sails. Upon the Armada as a whole, before a shot was fired, the surprise came as a shock that started its morale upon the downward slope.

2

'The wings of man's life,' wrote an English gentleman to his queen, urging her to make up her mind about war with Spain, 'are plumed with the feathers of Death.' Almost any educated Elizabethan seems to have been able to write like that, but few had the gift of making technicalities clear. If some inquisitive person with a scientific bent, like Francis Bacon, had been present taking notes at the Armada fighting we might understand better what really happened.

After dark on Saturday, the 20th, Howard had made sail from the Eddystone. He only tells us that the next morning, 'being Sunday, the 21st of July, 1588, all the English ships that were then come out of Plymouth had recovered the wind of the

Spaniards'. A daring manoeuvre, of a kind never before attempted by a large fleet in face of a larger one, is thus made to sound very simple. To recover the wind, now veering a little to the north of west—that is, to get to windward of the enemy, or astern of them—Howard could not steer north, towards the land; the Armada left no sea room for him there, nor did he want his lights to be seen. During most of the night, therefore, he stood far to the southward, right across the front of the Armada, and then beat dead into the wind past its right or starboard flank. Before daybreak on the Sunday he was well to the rear of this. Still undiscovered, the whole fleet came about, and with the freshening wind now astern, bore down after the enemy.

The manoeuvre was daring not only for its novelty and scale, but because it uncovered Plymouth. It was feared in England that the Spaniards intended to occupy the Sound as an advanced base. Howard and his admirals, however, seem to have relied confidently on hustling the Armada to leeward of Plymouth before it could rally from the shock of an attack from a quarter where none was then expected. They were perfectly right. All fleets tried to seize the weather-gage, but no Spanish fleet could have done in the time what Howard's had accomplished. Incredulous Spaniards, on that Sunday morning, swore that this apparition to windward must be some squadron—Seymour's perhaps—that had slipped by in the night from ports to the eastward.

Contemporary accounts of the fighting that followed almost ignore tactics. Those of the English fleet have been deduced from the course of events, and from tactical rules for a fleet action which English seamen had by now evolved. These show what great strides had been taken since Lisle and d'Annibault fumbled nervously forty years earlier. They embody the main principles of tactical developments of the future.

An offensive action was assumed, but in any case the fleet must strive to seize the windward position. It would then form line ahead, by divisions, ships following their respective admirals. Divisions would act as semi-independent units. The fleet would attack the enemy's weathermost ships, because they could not readily be supported by those to leeward. Then comes a significant warning—boarding is not to be attempted unless by order of an admiral. The battle is to be fought by guns. Having delivered

their fire at close range—'How much the nearer, so much the better,' said the younger Hawkins—ships were to come about in succession into the wind, passing their opponents on the opposite tack and firing their other broadsides on clearing the last ship of their own line. They would then come about again and repeat the process. This manoeuvre assumed marked superiority in sailing qualities over the enemy, which Howard possessed, but it was altogether too complicated for a fleet so mixed as his. What seems to have happened is that small groups of ships, perhaps three or four, sometimes manoeuvred together in line. They would almost certainly be Royal Ships, to some extent trained in keeping station. If, however, the English line as a whole was ragged, and often not a line at all, with its fire power soon reduced as untrained auxiliaries fell out, leaving most of the work to the navy, such a form of attack was entirely new to the Spaniards. At an early stage it threw two-thirds of the Armada into confusion.

This was steering a little north of east; the wind was WNW., and the weather clear. At 9 a.m. the English fleet, on a north-easterly course, passed the rearmost ships of the Armada's starboard division at culverin range. This division was the van, commanded by Alonzo de Leyva, who was to perish miserably on the Irish coast. Howard ignored it, pressing on across the chord of the inverted 'V' formed by the Armada to the latter's port or windward wing, two squadrons under Juan Martinez de Recalde. Within sight of the people of Plymouth, anxiously watching from the shore, ship after ship fell upon the rear squadron, Recalde's own. Drake, Hawkins and Frobisher were well to the front, where all three should not have been.

It may be too much to say that from this moment the Armada was a beaten force, but one of its major weaknesses was at once exposed. Of Recalde's ten galleons, only one stayed to support him. The rest loosed their sails to escape from the English artillery. The noble colonels might rage, but the merchant captains had no stomach for what seemed to them a diabolically rapid and accurate fire. They carried away with them most of Recalde's second squadron, and then the victuallers, and the whole crowded upon the central division, leading the fleet, in which were all but one of Sidonia's best fighting ships. Except for the van to leeward, the Armada had already lost all formation.

Through the confusion, which resulted in several collisions, the duke was striving to bring the *San Martin* to Recalde's aid. In his turn he was assailed by a number of English ships, of which he said in his report of the day's action, 'they were so fast and handy that there was nothing that could be done with them.' No less disheartening was the contrast between their rapid gun-fire and his own ships' slow and ineffective reply. With their small ports, as the Spaniards heeled, being to leeward, their shot passed over the low English vessels. Rigging and spars were cut about, but Howard's casualties were insignificant. On the English side the want was felt of more heavy guns; the preponderant culverins made little impression on the stoutly built Spanish ships.

Soon after midday, the fighting having drifted past Plymouth, Howard broke off the action. Some thirty ships from that port had still to join him, his fleet had become scattered, damage aloft needed repair, and on the Queen's Ships ammunition was already running so low that pinnaces were sent in with urgent demands for more. The van of the Armada, which had not been engaged, was joining the two disordered divisions. Its leading ships may have got into the fight, for on the *San Salvador* there was a violent explosion, and she fell away in flames. Wind and sea were rising, and another great galleon, the *Señora del Rosario*, which had been in collision, rolled out her foremast.

Howard's decision did not meet with the approval of some of his subordinates. Besides the reasons given, however, his responsibilities bore heavily upon him. He could not know that a part of the Armada was already demoralized; he was still outnumbered; and, like Admiral Jellicoe at the time of Jutland, he had to remember that upon his fleet might depend the fate of England. There was no other—or only Seymour's small squadron. The Spanish ships had stood up well to three hours of fairly close fighting. Had it been closer, they would have suffered more, but Howard's anxiety to preserve his precious battleships—another modern touch—lengthened the range which the English could dictate, beyond the really effective power of their few heavy guns, the 32-prs. So far they had escaped very lightly, but the crisis was still to come, and until then, as the lord admiral put it, he would be content with plucking the Armada's feathers.

3

While the English fleet was reassembling and taking on powder and shot rushed out from Plymouth, the Armada was streaming up Channel. Protected by a rearguard, the shattered *San Salvador*, her stern blown off, was patched up and made sail. The dismasted *Señora del Rosario* was abandoned, to be picked up by Drake during the night. She was the flagship of Pedro de Valdez, General of the Indian Guard, and this act of desertion had a depressing effect on the Armada. The *San Salvador* in turn failed to keep up, and was also taken, to sink after surrendering.

Medina Sidonia had overtaken his runaways, and was regaining control on that Sunday evening, before the English fleet followed, keeping at a respectful distance. During the night it was again scattered. Drake, whose *Revenge* was acting as a guide, put out his poop lantern and went in pursuit of some German merchantmen dimly seen to the south. A number of ships followed him, or lay-to, while others kept on with Howard, and it was not until late on Monday that the admiral once more got his fleet together. A day had been wasted. That night found the two fleets becalmed almost within gunshot off Portland Bill.

When the wind rose at dawn on Tuesday, the 23rd, it came from the north-east, and now the Armada had the weather-gage. Medina Sidonia was induced to disregard his orders and make the signal to attack.

Until late in the afternoon there was much confused fighting, amidst much smoke and noise. As the wind veered to its old quarter, SSW., to the advantage of the English, both fleets seem to have lost all order. Fragments fought their own independent battles. The Spaniards, according to Howard, were 'forced to give way and to flock together like sheep'. It was now five o'clock, and Medina Sidonia, covering his damaged ships, made sail to get out of the mêlée. The English were again running out of powder and shot, and the action came to an end.

In this long, scrambling day's fighting remarkably little material damage seems to have been done. The worst hit ships of the Armada were speedily repaired. Not one of Howard's was even temporarily disabled, and his casualties were again trifling. Those of the Armada were not serious, but if the action appeared

inconclusive it gave Spanish morale another jog downward. Once more it was shown that everything depended upon a few veteran fighters. Few of the merchant captains and crews had much heart left. For every shot they fired, the English fired three or four; splinters flew as the balls thudded home, and now and then one ploughed through the useless musketeers and pikemen crowded on the high upper decks. It was vain to try and close and board; so swift and nimble were the English ships that, as a witness said, 'the fastest vessels in the Spanish fleet looked as though they were at anchor'. These lowering influences were cumulative, and infection could breed panic, as was to appear.

For both commanders, the day brought further lessons. A weakness in the English method of attack was clearly shown up. Off Plymouth the formation by divisions, each led by its admiral, had soon dissolved, partly because the admirals, with other fast sailers, had pushed ahead to get into the fight with Howard. This Tuesday's battle had as soon degenerated into a sort of free-for-all. Howard felt it was time to instil a little discipline into the individualists under his command, and admirals were told that they must stay with their squadrons and control them. In this respect the Armada's training served it better; if a part of it was thrown into disorder, the more hardy fighters recovered their close formation.

Howard had now been joined by most of his other ships from Plymouth, and by more from ports to the eastward. Young sparks put out in anything that carried a saker or two. They had something to talk about for the rest of their lives, and if only a handful of these reinforcements added real strength to the fleet, to the Spaniards its numbers became impressive. All Wednesday, the 24th, it hung like a cloud behind the Armada, now approaching the Isle of Wight. Howard's pinnaces were again busy ferrying ammunition, and having now a hundred and twenty sail he reorganized them in four divisions, the fourth being given to Frobisher.

The Armada was also undergoing reorganization. Medina Sidonia, believing himself to be outnumbered, reduced his three main divisions to two, forming a strong rearguard of forty sail under Alonzo de Leyva to check attacks which Howard seems to have threatened, though for want of powder and shot he could not push them far.

4

Spithead is the only safe anchorage for a large sailing fleet between Plymouth and the Thames estuary. It was Medina Sidonia's intention to lie-to off the Isle of Wight, fighting a defensive action if one was forced upon him, while fast pinnaces brought him news from Parma. With the prevailing winds, in that uncertain summer, the harbourless lee shore from Calais to Dunkirk was no place for the Armada to linger, and if Parma was not ready it could take shelter at Spithead. It would be very difficult to shift it.

The English still believed that the Spaniards would try to secure a permanent advanced base, and might seize the Isle of Wight to protect the anchorage. Howard, accordingly, having reorganized his fleet and partially refilled his magazines, prepared to attack at dawn on Thursday, the 25th. Both fleets were becalmed during the night, several leagues south of the island, but the westerly wind rose again with the sun. Howard made the best of it, taking his own squadron and Frobisher's inshore, to get between the Armada and the Wight, while Drake and Hawkins made a wide cast to the south-east to pass de Leyva's rearguard and fall upon Sidonia's main division in the van. The English once more had a definite tactical plan, and it was decisive.

For two hours or more Howard engaged de Leyva. A big galleon drifted away disabled, to be wrecked on the French coast. The wind died down, and ships had to be towed, giving an opportunity to the oared galleasses, but they were beaten off, so hammered that they were not seen again. One of them, holed between wind and water, 'was fain to be carried away on the careen', and the report adds picturesquely that a second 'lost her lantern, which came swimming by, and a third his nose.' The calm was succeeded by what is described as a little gale, evidently from the south-west, and the vast mass of ships, amidst billowing smoke, streamed past Ventnor and Dunnose towards St. Helens. Medina Sidonia came about to de Leyva's support. Drake and Hawkins, having made their sweep to the south, were now bearing down under full sail upon the Armada's seaward flank; and as this onslaught pressed van and rearguard together off Sandown Bay, a fresh danger threatened. Ahead and to leeward stretched

the Owers, a sandbank well known to yachtsmen. With Drake and Hawkins to windward, there was neither time nor sea-room for the Spaniards to re-form in some sort of battle order. There was only one thing to be done, and the duke signalled for all sail to be set on an easterly course up the Channel.

Whatever colour might be put upon it, the Armada was once more in disorderly retreat, though still in the right direction. It was only ten in the morning. But Howard and Frobisher had fallen astern, their rigging cut about and their stocks of powder and shot again low. Drake and Hawkins, who do not seem to have been heavily engaged, rejoined the admiral, and pursuit was not resumed until later. Throughout the evening and night and the next morning, de Leyva's rearguard was kept within long cannon shot, but there was no fighting that day, Friday, the 26th, and by the afternoon the Spaniards could see the shores narrowing to the Straits, and Dover Castle on its cliff, and the tower of Calais church.

5

The Armada was still without news from Parma. Its pilots knew little about the North Sea, and they did not like the look of the weather. They warned Medina Sidonia that it would be rash to venture beyond the Straits. The duke came to a sudden decision; he led his fleet into Calais Roads and anchored.

The English fleet drew level and followed suit, half a league to windward of the Armada. At nightfall the Straits glittered like a city with the swaying lanterns of well over two hundred ships.

From Calais messengers were riding hard to Dunkirk. The next morning, Saturday, the 27th, Howard was joined by Seymour with thirty-six sail from the Downs. That night or early on Sunday the messengers returned from Dunkirk. They brought appalling news. Parma was not ready.

The Armada's delays had disorganized his plans. Food ran short and sickness ravaged his camps. He had dispersed his troops, and it would be a fortnight before the whole force was concentrated again and in a state to embark—if it could. Half of his barges, hastily built of unseasoned timber, were no longer seaworthy. His ports of embarkation, Dunkirk and Nieuport, were so closely blockaded by the Dutch that he could not get a

pinnace to sea. These were plausible reasons, but the impression remains that the duke was no longer trying.

On the Armada, on that dismal Sunday, the senior Spanish officers, exhausted and discouraged, seem to have sunk into apathy. No attempt was made to intercept Seymour while he struggled from the Downs against the wind. There is no indication that any decision was come to; yet the huge fleet could not linger in Calais Roads. Unlike the Downs across the Straits, the anchorage is quite unprotected, and the Armada was on a lee shore with the everlasting westerly wind growing gusty and strong. The French, in a friendly spirit, pointed out the dangers of the roadstead. More obvious, at the moment, was the reinforced English fleet, the country's whole naval strength, lying in the offing, waiting to pounce.

Howard and the queen's ministers had their worries. It is probable that Parma's unreadiness was known through spies, but he had some thousands of men in hand, and the Armada carried thousands more; and if the fear of a full-scale invasion was fading, it was to be expected that the greatest fleet ever to leave Spain, having come so far, would try to do something for honour. Having driven the Dutch from off Dunkirk, it might pick up Parma's available troops and sail up the Thames to seize Chatham. It must be dislodged and scattered, and at once, while it was still shaken and disheartened. There was a means to this end that would occur to any seamen of the time.

From the days of Greek Fire, whatever that may have been, wooden fleets had gone in dread of incendiaries. The Spaniards had used fireships quite recently against Drake at Cadiz. Two years earlier, at Antwerp, a devilish contrivance of the Dutch, ships filled with explosives, had blown a thousand of Parma's veterans to fragments, a horrid story which, with embellishments, must have been known to every man in the Armada.

Now, on this Sunday, while it lay at anchor 'very round and near together' in Calais Roads, at a council of war on board the *Ark* it was decided to attack with fireships that night, both wind and tide being favourable. Fishing craft at Dover were being loaded with faggots and pitch, but they could not be fetched in time, and eight small ships of the fleet were hurriedly prepared. Seymour had victuallers with him, some of which may have been sacrificed.

On board the Armada, says a witness, there was a great presentiment of evil as the Sunday passed in wrangling and inertia. The tide, very strong in the Straits, would begin to flow towards midnight, dead into the anchorage. As the west wind grew fresher, every Spanish ship put out a second anchor. The possibility of attack by fireships may not have been foreseen, but a screen of patrol craft was formed at dusk.

In the first hour of Monday, 29 July, nine days after the Armada was first sighted off the Lizard, sinister glows flickered and grew among the lights of the English fleet. It was a very dark night, the moon rising late, but their own mounting flames soon revealed the eight vessels bearing down with the wind and tide. Like gigantic torches, rigging and canvas ablaze, they rapidly drew near. Two of the patrol boats pluckily grappled one of them, but the rest of the screen fled. The fireships' shotted guns, as the heat reached them, went off and added to the terror of the scene. To the Spaniards they suggested explosives, and recalled the infernal machines at Antwerp. With the two fleets only a mile or so apart, the ships of the Armada, riding head to wind and tide on their anchors, had no time to weigh, as Medina Sidonia may have ordered by signal gun; instead, one and all, a hundred and twenty of them, they slipped or cut their cables.

Chaos and panic ensued. In the lurid light, which brought all Calais out of bed, as the confused mass drifted eastwards ships crashed together and spars were carried away. The drift saved the Armada from immediate perils, greatly magnified as these were; it was swept clear of the path of the fireships. But these had done their work. Had it been possible to rally the fleet in the darkness, it was left with few anchors available. Most of the spares were deep in the holds. When eventually the *San Martín* was able to anchor, Medina Sidonia found himself almost alone. There was no hope of regaining the moorings abandoned in the roadstead, and he had to weigh again and follow his panic-stricken flock, now heading in wild confusion for the North Sea.

6

Fleet actions at night were then almost unheard of, but it seems remarkable that the English, having loosed their fireships, did

nothing to follow up the attack, not even sending scouting craft to discover how it was faring. Lying within a mile and a half of Calais, they could watch the flames flare and dwindle, but of what was happening in the anchorage they appear to have known nothing. Only at dawn did they realize that not a sail remained there. Dimly seen to the north-east, towards Gravelines, where the Straits begin to widen, the Armada was in full flight.

Howard, who had now perhaps a hundred and forty ships, at once weighed in pursuit. Until the Spaniards had been driven to leeward of Dunkirk, they must not be allowed a breathing space. A rearguard formed by Medina Sidonia being overtaken, this Monday's action, the last of the campaign, saw the fiercest fighting of all. There was no longer any question of preserving the English battleships; they closed in, sometimes to hailing distance. The Spanish musketeers were firing from their crocks or rests. On some of the ships of the Armada's rearguard the losses were terrible. At such ranges even their slow fire should have been damaging, but they were running out of shot, and though English ships, the *Revenge* among them, were knocked about, their casualties were only a fraction of the enemy's.

Had Sidonia been given a chance to rally his fleet, it was no longer a fleet. The panic-stricken flight before the fireships completed the general demoralization, and from that moment no shreds of the 'Enterprize of England' could be salved. Now, continually pressed against a lee shore, the dreaded Zeeland Banks, from which only a sudden shift of wind saved the rearguard, the Armada was fighting for its life.

Once Dunkirk was left well astern, Howard was content to follow. The fighting was over and the weather took charge. The Armada could only run before the gale, the Spaniards' one thought now being to get back to Spain by the only course open to them, north-about round Scotland. The wind moderating, the English shepherded them beyond the Tyne, and there left them to the mercies of our summer.

In the end, helped by sickness and shortage of food and water, this hurled them by whole batches on the wild western coasts of Scotland and Ireland. That these castaways got as far as they did, and that the remainder, more than half of the hundred and twenty sail that fled up the North Sea, lived to reach Spanish ports,

their timbers shattered, their crews mostly dead of wounds, scurvy or starvation, says much for Spanish seamanship. Speaking of the course set north-about to beyond the Hebrides, and of the survivors' beat out into the open Atlantic until, in the latitude of the Shannon, they could safely head south-east for the Biscay coast, the Armada's latest historian observes that somewhere in the fleet, probably in the flagship, there was 'an absolutely first-class navigator'.*

Two-thirds of these survivors were fighting ships. The many wrecked galleons of English legend, full of gold and plate and jewels, were mostly transports and victuallers and smaller craft. Of Medina Sidonia's hard core of twenty-eight authentic men-of-war, taking in the Indian Guard and the *Flota*, in all the fighting and the wild voyage home only half a dozen seem to have been lost. As a class they were among the best handled ships, as they were among the best fighters, in the Armada. The names of some of them occur again and again in the series of actions from Plymouth to Gravelines. Little is heard of the forty auxiliaries. It is the same with the English fleet. Stoutly as some of the requisitioned merchantmen may have fought, Howard's sixteen Royal Ships, and later Seymour's five, were the head and front of every onset.

As the fate of the Armada became known, it seemed to most Englishmen that God had blown with His winds and had scattered His enemy and theirs. Sea power being still little understood, only a few realized how powerfully Providence had been aided by the navy, and still fewer how and why that navy had been victorious. In six days' fighting the warship of the future, and the essential principles of its use, had passed their first big test. In the navy itself the battle formation of line ahead, reliance upon short-range broadside fire, and (with lapses) the tactic of concentrating upon the enemy's weathermost ships, all first tried out against the Armada, were to last as long as the sailing rig.

In an exciting age of revivals, inventions and discoveries, loosely covered by the term Renaissance, England is thought to have lagged behind. In her practical way, she made at least one contribution, of vital importance to herself as an island power —the first really efficient fighting ship. It was this ship, not the winds and waves, that beat the Armada.

* Michael Lewis, *The Spanish Armada*.

PART TWO

FROM THE ARMADA TO THE IRONCLAD

CHAPTER SIX

The Seventeenth Century
The Ships

1

THE invention of sheathing from its earliest forms, and improved methods of seasoning timber, could give wooden ships very long lives. By stretching a point, four British ships of the line can be made to cover the two hundred and seventy years between the defeat of the Armada and the launching of the first ironclad. The *Victory* is not included, since as a national monument she has had special treatment, but the latest of these four, which had at least two and a half times the tonnage of the earliest, and carried three times the weight of ordnance, was afloat less than fifteen years ago. Neither structurally, as a machine in which men had to live and fight, nor in her armament, did she show any marked advance on her predecessor built nearly two centuries before her. The designers of both vessels had to work within the limitations of wooden-ship construction, but the fact that within so long a period the only major development in naval architecture (sailing rig apart) is an increase in size is evidence that the later Elizabethan shipbuilders had not much to learn.

Their *Ark Raleigh*, the first in the sequence, was completed at Deptford, a royal dockyard, in 1587. Becoming the *Ark Royal* after flying Howard's flag in the Armada campaign, she was renamed *Anne Royal* by James I, whose queen was Anne of Denmark. A four-master of 800 tons, at different dates she is given thirty-eight and forty-four guns, the heaviest being 32- or 30-pr. demi-cannons. Howard thought her a very fine ship, and she might have lived to a ripe old age, but in 1636, her forty-ninth year, she holed herself on a fluke of her anchor and sank. After being raised, she was broken up.

In her lifetime two much bigger ships were laid down—the 80-gun, two-decker *Prince Royal* in 1608, and the *Sovereign of the Seas*, completed in 1637. Like the *Henry Grace à Dieu*, the *Sovereign*

was the largest fighting ship of her day. Of about 1500 tons, she was a three-master, the bonaventure mizzen being by now all but discarded. Carrying a hundred and two guns (whole cannons, demi-cannons, culverins and demi-culverins, names that were also soon to disappear) she was the first British three-decker. The point to be noted here is that she was a long-lived ship and, like the *Anne Royal*, should have lived longer. She was approximately sixty when she was accidentally burnt in 1696.

Only drawings of the *Sovereign* survive, but by something like a miracle a big warship of her day is now lying in dry dock. In 1628 the Swedish two-decker *Vasa* heeled over and sank in Stockholm harbour when starting on her maiden voyage. The rotting of a ship's timbers is caused by boring worms, but because of the brackish water of the Baltic they cannot breed there; this being well known, divers were sent down to hunt for the *Vasa*, and after a long search they found her. Working in almost total darkness, holes were tunnelled in the mud under her hull and cables passed through them; her ports and her stern were boarded up and, in 1961, the three-hundred-year-old ship was raised.

The mud of British harbours is more destructive, but with warships of a rather later date we have the next best thing to the vessels themselves. The Tudor master-shipwright, like generations before him, worked out a draught on his table to a scale of ¼″ to 1′, using a small pair of callipers or divided compasses; by means of larger callipers he then transferred every curve of the design to the actual timbers of the ship lying on the floor of the moulding loft.* About 1600, to the great advantage of students of naval architecture, shipwrights began to make scale models of warships.

In the Science Museum at South Kensington is a model of the 100-gun, three-decker *Prince*, built in 1670, while the *Sovereign* was still in commission. Succeeding the *Prince Royal*, renamed *Resolution* under the Commonwealth, it is with her that by stretching a point the fun, or fantasy, begins.

'She was broken up in 1692,' says a descriptive note on the model, 'and that part of her timber which was sound was used in the building of the *Royal William*.' A list of Charles II's navy, however, says of the *Prince* that she was 'rebuilt' as the *Royal*

* T. K. Derry and T. I. Williams, *A Short History of Technology* (O.U.P., 1960).

William. Before this time ships were often 'rebuilt'—the *Anne Royal* was, at least once, and the first *Prince* several times—and the term seems to cover everything from extensive repairs to drastic reconstruction. Its increasing use implies that as a rule it meant what it says and not merely the insertion of a few timbers from an old ship into the frame of a new one. Between 1670, when the second *Prince* was completed, and 1719, the next relevant date, some fifty first and second rates alone underwent 'rebuilding'.* In 1692, when the *Prince* is alleged to have been broken up, she was not even old, but a mere youth of twenty-two. The *Royal William*, which simultaneously appears, was also a three-decker of a hundred guns, and though she has put on an extra 170 tons, and is the longer of the two, enlargements on a much bigger scale are not unknown. They were effected by cutting a ship in half and inserting a new central section. A hull being under the greatest strain amidships, the process tended to weaken it. The *Prince* was no doubt overgunned, like all British warships, and it may have been hoped that an increase in her length would make her a better sailer. By this date, moreover, good ships' timber was becoming scarce and expensive, and rebuilding used up less than new construction.

Having taken conjecture so far, there is more to come. In 1719 the *Royal William* herself was 'rebuilt' at Portsmouth. The result was a ship of 1900 tons, still carrying a hundred guns, and again it is assumed that she was in fact brand new, embodying only some of the first *Royal William*'s timbers. But the latter, like the *Prince* in 1692, was still in her twenties, a very early age for a first rate to be broken up. If there were indeed two of the name, the second alone was to show how long her class could live, for she was ninety-four when her Port Admiral's flag was finally lowered at Spithead in 1813.

These big ships required overhaul and repairs about every fifteen years, and this second *Royal William* may well have undergone several thoroughgoing 'rebuildings'. Her bottom timbers, in spite of sheathing, and perhaps her sides, would more than once have been entirely renewed; but age would merely harden internal oak beams and knees. In nearly a century her outward appearance was greatly altered. In 1719, if not the

* *Lists of Men-of-War, 1650–1700* (The Society for Nautical Research, 1930).

Prince of 1670, she would have looked very like her, having the same marked sheer, ornate stern galleries, bluff bow and round tops, a lateen on the mizzen and a spritsail topmast. By 1813 she had become a typical three-decker of the last days of the wooden fighting ship. For the purposes of a fanciful argument it will be assumed that the two vessels were one, rebuilding having converted the *Prince* into successively larger *Royal Williams*, the process bridging the long gap between the burning of the *Sovereign of the Seas* and the launching of the fourth ship in this series. The assumption is not quite so far-fetched as it may sound, since (excluding the *Victory*) this ship holds the world's record in any navy for longevity afloat.

Launched in 1798, the 74-gun *Duguay-Trouin* escaped from Trafalgar but was captured with other survivors by Sir Richard Strachan a few days later. Taken into the Royal Navy as the *Implacable*, she was still serving as an accommodation ship in the Second World War. Not until 1949 was her ancient and much-patched frame condemned as beyond further repair. Towed from her last berth, flying the French and British flags, she was ceremonially sunk in the Channel.

She was fifty-eight years old when the first ironclad was launched, the French *Gloire*. The *Gloire*'s guns were 70- and 40-pr. breech-loaders, but when the *Implacable* ended her seagoing career her heaviest pieces were the 32-pr. muzzle-loaders standard in the British navy from the time of the Armada until 1840. They formed the main battery of all four ships here dealt with. Only the name changed; the crew of the *Ark Royal* called them demi-cannons. The later types had been given sights, and windage having been somewhat reduced and the quality of powder improved, they were more accurate and had a longer range than their Tudor forerunners; but in effect a ship's artillery had scarcely progressed since Henry VIII put his great guns from Flanders on board the *Henry Grace à Dieu.*

2

The English seamen who had to fight the Armada preferred the 'middle-class' galleon of from 500 to 700 tons because with the limited rig of the time and the heavy batteries demanded the type

proved faster and more handy than ships of the 1000-ton class. It was a question of the ratio of sail area to weight, and by the end of the century an increase of the former was under way. Topmasts that could be struck brought in the topgallant sail, which was standard in the English navy by 1600. At once a move began towards bigger ships. The *Prince Royal* of 1608 was a vessel of 1200 tons. Hawkins's *Victory* is said to have been 'built into her', whatever the phrase may mean. She was barely afloat when another sail was added to the rig, a square topsail on the mizzen, to be followed by a mizzen topgallant sail and the sprit topsail, carried on a short mast rising from the bowsprit above the spritsail. Mizzen topsails did away with the need for a fourth mast, and the bonaventure vanished. Both topsails and topgallant sails, at first cut narrow in the head, were widened. Soon afterwards studding-sails, strips of canvas set on short spars outside the main courses and topsails, replaced the bonnet of antiquity as a means of increasing the sail area. With all this driving power what were still lacking were fore-and-aft sails to increase a ship's ability to work to windward, and jibs may have been in use by 1660. Before the end of the century staysails appear —triangular sails run up the stays of the mainmast and mizzen. More staysails and jibs or foresails were to come, but except for the latter, by 1700 a battleship's rig was virtually that of her successors at Trafalgar. A relic from the past was the lateen, to be retained until about 1800, though small ships were fitted with a gaff from about 1760. The larger ships had the fore part of the sail removed but the yard remained. When the century ended, another survival from Tudor times, the round top, began to have its after side squared off.

Until 1660 the *Sovereign* was the only 100-gun ship in the British navy. Though there was much building under the Commonwealth, the tendency remained to concentrate on the medium-sized battleship, of from thirty to sixty guns, the smaller class being still considered fit for the line of battle. It was after the Restoration that the big three-decker came in to stay; in the first ten years of Charles II's reign, nine of between 1000 and 1300 tons were built, including one 100-gun ship and six of ninety or ninety-six guns.

In this reign, also, the process of fixing establishments of

guns for the different classes, and of rating the ships themselves accordingly, was more or less stabilized. In James I's time we hear of three or four 'ranks', and by 1650 a fixed system of rating was in force. First rates (the *Sovereign* being the only one of this class) carried a hundred guns; then there was a big drop to the second rates, with fifty-two guns, third rates with forty-six, and fourth, fifth and sixth rates with forty, twenty-four and eighteen guns respectively. These figures were not strictly adhered to. The lessons of the first Dutch War caused the four middle rates to be up-graded, with a consequent increase in size, and when James II came to the throne in 1685 the tonnage and force of the largest ship in each class were as follows:

Rates	*Tons*	*Guns*
1st	1739	100
2nd	1546	90
3rd	1174	70
4th	685	54
5th	333	32
6th	199	18

In course of time the ratio of guns was to alter in the five lower rates and the 74, for instance, became the standard third rate. The classification lasted officially long after it had been abandoned in practice, ships of the line coming to be known by their gun establishment (for example, again the 74) and the fifth and the bigger sixth rates as frigates, a class which, with larger batteries, was to have its own sub-divisions. From the time of the *Sovereign of the Seas*, first and second rates, being three-deckers, were almost always employed as flagships, their extra deck providing accommodation for an admiral and his staff.

A further rational step taken in the reign of Charles II (to whom we owe the official title 'Royal Navy') was the standardization of batteries in the first three rates, each gun-deck being given guns of the same calibre and weight. The heaviest had to go on the lower deck, but Charles I's *Sovereign* kept the old mixed order, having whole and demi-cannons on her lower deck, culverins and demi-culverins on the deck above. These names persisted for some years, the *Prince* of 1670 having 'cannons of 7', or 42-prs. and the two types of culverin, but the cannons reigned alone on the

lower deck. When medieval terminology was dropped, guns were described by the weight of their shot; and as the century ran out, the heavier cannon went with it, except for a time on a few first rates, and the 32-pr. became and remained the battleship's lower-deck gun.

Other traditions of the Armada days lingered. The fireships at Calais had made a noise out of all proportion to their real worth, and every navy now included them. The Dutch, in particular, with happy memories of their infernal machines at Antwerp, were much addicted to fireships, no Dutch fleet in the Narrow Seas being without a number of specially constructed combustible craft. In a fleet action they were employed against the enemy's crippled vessels. The enemy at this time was usually Britain, and the Royal Navy had its fireships, but in the lists they figure only occasionally as ships built for the purpose. Though fireships might have some moral effect in a battle at sea, it was soon apparent that they were a serious threat only to a fleet surprised at anchor in an open roadstead—a rare contingency. The Dutch made good use of them in the Medway in 1667, but such a panic as they had created at Calais was not to be repeated until Cochrane exploited them in the Basque Roads in the last years of warfare under sail.

It may also have been a memory of 1588 that caused British ships of the line to be for long overgunned. The heavy batteries of Drake's *Revenge* and others were in fact only heavy for ships of their time. That of Howard's flagship in her last days as the *Anne Royal* weighed sixty-four tons, which was about the weight of the batteries of the first 36-gun frigates, ships roughly of her size. The frigates, however, being cruisers, had a uniform light armament of 12-prs.; the *Anne Royal* was a battleship, and her very mixed battery of forty-four guns may have included four 30-prs., four 24-prs. (cannon-perriers), and twelve 17-pr. culverins. In her lifetime the *Sovereign of the Seas*, of about twice her tonnage, was designed to carry three times as many heavy guns, culverins and upwards. The more and the bigger the guns, the greater was the weight of shot for them in the hold. Up to the middle of the century, ships of from 650 to 750 tons were given fifty or sixty guns, and though size in relation to armament then began to increase, the increase was insufficient. In 1673, after the

revival of the French navy under Colbert, a French squadron visited the Thames; the king and the Duke of York, both of whom took a knowledgeable interest in naval construction, were so impressed by the new 70-gun *Superbe* that several large 70s based on her design were at once laid down. But the example was not remembered. Thirty years later a captured French 60-gun ship was found to be much larger than any British 60, while the French, having taken one of our 64s, were reducing the number of her guns to fifty. It will be seen that while British ship design was to remain in the hands of shipwrights, empirical traditionalists suspicious of innovation and theory, in France scientific principles were already being applied to naval architecture.

3

A man who saw the *Sovereign of the Seas* in her early days, and a ship of the line built thirty or forty years later, would notice many superficial changes in the latter. The *Sovereign* retained characteristics of Tudor times. She still had the long narrow beakhead, a relatively short mizzen, and the square or transom stern going back to the days of the *Henry Grace à Dieu*. Tudor galleons had simple open quarter galleries, used as officers' latrines, connected by a gallery across the stern, the whole painted in crude bright colours; the *Sovereign* had her quarter galleries, but no stern gallery, which was not to come in again until the end of the century, and the former were much enlarged, covered, and embellished with gilt domes, forming, with the whole of her high stern above the rudder, a glittering mass of costly carving and gilding. A painting of her and her builder, Phineas Pett, attributed to the two Van de Veldes, shows the warship at its most decorative.

By 1670, though sterns were still gorgeous, they were less extravagant. The form of the hull beneath was rounded. The projecting beakhead had vanished, the bow having become a bluff upright curve, surmounted by the figure-head of a lion. Individual figure-heads, often representative of a ship's name, came in twenty years later. A ship's outward lines were still marked by a considerable sheer, but the tumble-home of the *Sovereign*'s time was modified. Ornamentation was carried rather

charmingly from bow to stern by gilded wreaths round the upper tier of gun-ports. The 1670 model was in fact a very graceful vessel.

Gun-ports were still only two feet six inches square, but before this date naval guns and their carriages had attained a form which was to remain standard for another two hundred years. Once ornamented, but now plain, the barrel of the gun tapered from the breech almost to the muzzle. The breech later ended in an eye, to take the breeching, the rope which, secured to ring-bolts in the ship's side, controlled the recoil. Though cast in one piece, outwardly the barrel was divided by a series of reinforcing rings or mouldings into four parts, the vent-piece, the first reinforce, the second reinforce, and the chase. A relic of the more ornate past was a little ring round the knob which preceded the breeching eye; it was called the cascabel, having originally taken the form of a snake. Round the breech itself ran the base-ring and the breech astragal, a term borrowed from architecture; then came the first and second reinforce rings and, at the end of the chase, the muzzle astragal. Here the barrel ceased to taper, the muzzle being strengthened by a moulding which splayed outward in a modified trumpet form. From a point on the barrel rather nearer to the breech than to the muzzle, just behind the second reinforce ring, trunnions projected to fit into bearings on the gun-carriage.*

Of this primitive conveyance it is remarked in a work on naval gunnery published in 1897 that it had finally been discarded by the navy only within the past few years. It may still be seen on board the *Victory*, and in pocket form on the lawns of yacht clubs. Service conservatism has preserved in its correct name of truck-carriage the old meaning of 'truck', and of its diminutive 'truckle', as a small solid wheel. Simplicity itself, the carriage consisted of five wooden parts—two sides termed brackets, front and rear ends, or transoms, joining them, and a movable bed which rested on these. The four solid wooden trucks were fastened to iron axles by linch-pins. Bearings for the gun-trunnions were hollowed out at the forward ends of the brackets, the trunnions being secured by hinged iron straps. The after halves of the brackets were cut into three steps; to give the gun its required

* Charles Ffoulkes, *Arms and Armament* (Harrap, 1945).

elevation, its breech was levered up by a hand-spike using one of the steps as a fulcrum, and a wedge-shaped block of wood called a quoin, marked in degrees, was thrust between the breech and the horizontal bed. To train the gun to right or left, as far as the width of the port allowed, hand-spikes were thrust beneath the inner and lowest steps, or horns, of the brackets, and the mass of metal and timber was levered laboriously round, no light task with the three tons of a 32-pr. This crude use of hand-spikes did much damage to deck planking, and captains who put outward smartness before efficiency (a tendency that was to develop dangerously between Trafalgar and the War of 1812) made it an excuse to restrict gunnery practice.

In all navies ships have flown very large battle flags, and at this turn of the seventeenth century enormous squares of bunting were hoisted at the fore and main mastheads on all occasions. The red, white and blue squadronal flags were introduced in the British navy in 1625 and were flown until 1864. Except during the Commonwealth and Protectorate, all ships flew the first Union Jack, combining the red cross of St. George and Scotland's white saltire on a blue ground, on the spritsail topmast jackstaff. In the next century a fleet commander ran up a large Jack at the main. A smaller one was flown on the spritsail topmast, to vanish with this but to reappear in its final form, incorporating the diagonal red cross of St. Patrick, in the bows of the ironclad. A hundred years after the period under notice, during the wars with revolutionary France and Spain, it was found that the Red and Blue Ensigns were confused with the enemy's flags. Howe ordered all ships to fly the Red Ensign, but since the late 1790s the White Ensign has been flown as a distinguishing symbol by every British ship-of-war.

CHAPTER SEVEN

The Dutch Wars

1

HAVING defeated the Armada, the British navy (as it may be styled after 1603) was not engaged in fighting that tested seriously its ships or seamen for sixty-four years. In the next twenty-one it fought nine big fleet actions, not counting Blake's destruction of the Spanish treasure ships at anchor at Teneriffe in 1656 or the disastrous blow struck by de Ruyter in the Medway eleven years later. The Dutch were the enemy in all the actions at sea.

At the outbreak of our Civil War in 1642 the navy included two first rates, the *Sovereign* and the *Prince*, and thirty-four other ships of between 300 and 850 tons. Five of about 380 tons, having thirty guns on one deck, have been called the first true frigates. The application of the name had undergone the wildest fluctuations, from small oared craft in the Mediterranean to two- and three-deckers, including the *Sovereign* herself; in its final sense, denoting a class designed for particular duties, it was not adopted for another century.

With the establishment of the Commonwealth in 1649 a big shipbuilding programme was put in hand. By the end of 1651 more than twenty ships fit for the line of battle had been added, and when the first Dutch War began in the following spring another ten had been launched or were on the stocks. Altogether, in the eleven years of the Commonwealth and Protectorate, more than two hundred ships of all classes were built. This remarkable growth of the navy was a rather ironic sequel to the outcry about Charles I's Ship Money fleet. Revolutionary governments are always belligerent, but the initial incentive was commercial rivalry with the Dutch.

Trouble with the United Provinces of the Netherlands had been brewing in James I's reign. The Provinces had united themselves to repel Spanish aggression, and in the process they had created a fleet. With the decline of Spain and the acquisition of

distant colonies the Dutch had become the world's leading maritime and commercial power. They carried on the Spanish tradition of trying to bar commercial competitors in regions they regarded as their own; British factories in the Spice Islands were forcibly closed, and British agents were murdered. The British retaliated by what the Dutch (like the Spaniards) deemed to be acts of piracy, and adopted a stiff attitude in home waters, particularly over the vexed question of saluting the flag. Dutch ships that did not salute promptly were fired into, and even captured. The situation worsened during the Civil War, one of the political parties which divided the Provinces openly supporting British Royalists. The real bone of contention, however, was always commerce; and it was because the Dutch saw their predominance at sea threatened by the shipbuilding programme of the novel and pugnacious Council of State in London that the inevitable conflict came as soon as it did.

As a colonial power the Provinces had one very weak point—the geographical position of the homeland. This depended for its prosperity upon its seaborne carrying trade, and for mere day-to-day livelihood upon the herring fishery in the North Sea. To reach port, every bale of merchandise and every cask of herrings had to pass through the narrowing waters converging on the Straits of Dover and flanked by British harbours from Cornwall to the Forth. With privateers from Dunkirk or St. Malo always prowling in the Channel, Dutch East Indiamen, themselves heavily armed, were convoyed by warships, which were often involved in what would now be called 'incidents' with British cruisers. The herring fleets were a permanent cause of friction between the two countries, since they persisted in fishing in British waters under the protection of a flotilla of smaller ships-of-war. In spite of the Ship Money fleet, the British navy was no serious menace to the Dutch until the Commonwealth, laying down ship after ship, and becoming increasingly intransigent over matters in dispute, was obviously determined to force the issue sooner or later. Two, however, could play at this game, and when the Dutch admiral, Tromp, was sent to sea in the spring of 1652 under general orders to protect his country's commerce, there can be little doubt that he intended to provoke a clash. From the point of view of the Dutch, the inevitable had better

be brought about while the rapidly growing navy of the Commonwealth was still numerically inferior to their own.

That in other ways it was superior was, however, clearly shown when the clash duly came. Dutch ships were designed to navigate the shoal waters of their own coast; of shallow draught and flat-bottomed, they were less weatherly than the British, and, rate for rate, were smaller, of lighter scantling, and carried fewer guns. Dutch tactics still envisaged closing and boarding, and insufficient attention seems to have been paid to gunnery; the British, trained for broadside fighting, had much the best of this. There was nothing to choose in determination and technical skill between the two fleets. The Commonwealth's captains and crews had been continually at sea throughout the Civil War and after, doing blockade duties, chasing Prince Rupert's handful of ships from Ireland to the Mediterranean, and, within recent months, assisting at the capture of the last Royalist strongholds, the Scilly Isles and Jersey.

With both sides spoiling for a fight, when on 19 May, Blake with fifteen ships met Tromp's fleet of forty sail between Dover and Calais, who fired the first shot is immaterial. Blake, whose small force came up piecemeal, was in grave straits until Bourne, with eight ships from the Downs, fell upon the Dutch rear. His arrival turned the scale, and after some hours' cannonading Tromp hauled off, leaving a prize or two behind him. The United Provinces being then the leading naval power, this action, in which twenty-three ships under a lieutenant-colonel and a major beat off a fleet of forty commanded by the most renowned admiral of the age must have come as an unpleasant surprise to his countrymen.

2

The two countries thus plunged into war were eventually able to concentrate almost their full naval strength in what to both were home waters, and a feature of this and the wars that followed is the size of the fleets engaged. They were usually unmanageably large.

This had also been a feature of the Armada campaign, but that was in a class by itself. The Armada, though trained as a

fleet, was not seeking a battle. It was only in the most general sense that Howard exercised control over his heterogeneous collection of vessels, while his anxiety about his small nucleus of battleships caused sudden fits of playing for safety. There was little playing for safety in the Dutch wars, at any rate by the commanders. The upshot was some of the most determined fighting ever seen at sea and, owing to the size and composition of the fleets, some of the most disorderly and unintelligible.

Line ahead was now the accepted battle formation for a British fleet. The Dutch, like the Armada, seem to have relied on squadronal clumps, the ships of which manoeuvred with an eye to mutual support. In the first actions of this war the squadrons of the British line may also have acted more or less independently, but before the end it appears in theory to have become continuous. British and Dutch fleets, however, might number eighty or a hundred sail, and they were very far from being homogeneous, or, as a whole, highly trained. Their best elements, the ships of the regular navies, included fourth and fifth rates, too weak, as the event was to prove, for the battle line. Both fleets were still padded out with less efficient and sometimes less warlike merchantmen, the proportion in a British fleet being perhaps twenty-five per cent, while with the Dutch, whose big Indiamen were among their most powerful vessels, it was much higher. Eighty sail or more of such a mixture of rates and types, of sailing qualities and degrees of training, might, when in line ahead straggle over ten miles of sea. Wherever the admiral in command stationed his flagship, he could not control such a line once action was joined. It was in any case too long to keep its formation. In these fights with the Dutch the unmanageable lines soon broke up, fragments indulging in independent and furious mêlées of their own.

The Dutch fleets were commanded by seamen, the British by soldiers. Blake appears to have been made a General-at-Sea because the Council of State mistrusted the loyalty of some of the senior naval officers. The habit being formed, Blake was succeeded by Monk, another infantry soldier, and after the Restoration by Prince Rupert, a cavalry general who had some sea experience, and the Duke of York, who, though he understood naval affairs, was in no sense a seaman. This curious system

worked fairly well, the military admirals having the sense to leave practical details to the professionals; if Monk ever told the captain of his flagship to wheel to the left, he knew that the order would be correctly interpreted. With the end of the third Dutch War came the end of the Generals-at-Sea, who had become merely interesting relics of antiquity. The next war, before the end of the century, the first of a very long series with the French, saw admirals at the helm who had been bred to the sea. As things fell out, at first the change was scarcely for the better.

Most of the nine fleet actions in these Dutch wars were fought in the same narrow waters between the shores of Kent and Essex and the flat coast of Holland. Tactics were governed by the long lines of sandbanks that cover both coasts and by the westerly winds that prevail in this region for two-thirds of the year. Though Tromp once broke the rule, fleets, like armies, were not then expected to campaign during the winter months. Dutch admirals usually aimed at forcing action near the English coast, where the Goodwins, the Long Sand, the Kentish Knock and innumerable other shoals stretch from Dover to the mouth of the Stour. Their ships could make the best use of shallow waters, which hampered the British, with their deeper draught and sharper keels. Being as a rule to leeward, the Dutch could run for home across the open sea if the fight went badly for them, whereas if they were defeated off their own coast crippled ships might be driven ashore and others put in jeopardy while crowding to escape through the deep-water channels to the anchorages in the Schelde.

It was in these chosen conditions that they provoked the first battle between fleets of equal strength, five months after Blake's engagement with Tromp's stronger fleet in May 1652. The tactics off the Kentish Knock at the end of September happen to be reasonably clear, because of the unusual caution displayed by both Blake and de Ruyter, who had superseded Tromp. As ships badly damaged in the action in May were still under repair, Blake may have been cautioned by the Council of State. All that happened off the Knock was the type of formal engagement, line against line, that was to be the bane of British naval tactics in the next century. De Ruyter breaking off the fight, Blake could claim a victory. Tromp being restored to command, two months later,

though the normal fighting season was over, he came down the Straits with over eighty sail, and Blake, with less than half as many, engaged him off Dungeness and suffered a heavy defeat. In February 1653 Tromp was out again, to meet a large homeward bound merchant fleet at the mouth of the Channel; at the end of a three days' running fight from Portland to the Straits his defensive screen was broken; more than fifty merchantment were taken, and seventeen men-of-war. The victors lost one, a 24-gun, hired ship, blown up or left to sink.

By now the United Provinces were nearing exhaustion, the destruction of their fisheries and commerce threatening them with financial ruin; yet three months after this defeat Tromp was at sea again with the largest fleet he ever commanded, about a hundred sail, to carry the war once more to the English coast. Dover was bombarded. The Commonwealth, however, went one better, and Monk and Deane, with a hundred and five ships (later reinforced by Blake with a further eighteen), met the Dutch off the North Foreland on 2 June, and drove them back to take refuge among their own sandbanks. This was almost the end; one more lost battle in July, in which Tromp was killed, forced the Provinces to make peace.

3

The peace was no more than a truce, the two countries' commercial rivalry being resumed more bitterly than before. Both prepared for another naval war, and the one just ended being the first of its kind, both took to heart the lessons to be learnt from it.

The most obvious, whatever the battle formation, was that it was no place for lightly built and weakly armed ships. They must inevitably come up against the broadsides of vessels of much greater force. With the smaller, homogeneous fleets of the future, in which the standard unit was the 70- or 74-gun two-decker, it was a very rare event indeed for a ship in the line of battle to be sunk by gun-fire; the much publicized sinking of the *Vengeur* in the battle of the 1 June, 1794, is the only instance that comes readily to mind. In the first Dutch War a remarkable number were sunk in this way, the Dutch themselves being by far

the greater sufferers. Thirteen of their ships were listed as sunk, three were 'lost in action', as distinct from those burnt or captured, and of more than fifty whose names simply disappear some may well have been sent to the bottom by gun-fire.* The biggest known to be sunk was a 40-gun East Indiaman; among the other twelve were ships of twenty-eight and twenty-six guns, and seven were merchantmen. While Dutch ships of all classes were inferior to their British equivalents, it was the weakest that went down. Very few British ships are reported (one or two rather doubtfully) as sunk in action, and they were fourth or fifth rates, or hired. Prizes taken by both sides tell the same story—all belong to the medium or lower rates. Here again the balance was heavily against the Dutch, but their ships being unpopular with British seamen, who regarded them as unweatherly and poor sailers, almost all those captured were laid up until the next war was seen to be imminent, when a number were put into commission.

Another point of interest, while on the subject of losses in action, is that the Dutch had at least seven ships burnt or blown up, against the British two. Fireships were usually included in every large fleet, but there is little or no evidence that they caused any of these disasters. Figures for the next two wars confirm the impression that precautions against fire, so terrible a menace to wooden warships, were more thorough in the British navy than in the Dutch.

Until fleets were reduced in size, ships unfit for the battle line continued to figure in it; but during the uneasy lull between this first war and the second, both adversaries took steps to diminish the proportion of what in every sense were the weaker vessels. The Commonwealth, now become the Protectorate, built in the next six years one first rate, four 80- or 70-gun ships, and a baker's dozen of 50s and 60s. Only three of the once popular 40- to 48-gun class were laid down. The auxiliary element was strengthened by a more rational selection; the smaller classes of hired ships attached to a fleet were no longer expected to take part in a general action. Naval officers were appointed to the command of those put in the line. The Protectorate left a powerful navy of a hundred and fifty ships for Charles II to take over, and for the first few years after the Restoration the shipbuilding

* *Lists of Men-of-War, 1650–1700* (The Society for Nautical Research, 1930).

programme slackened. It was accelerated again when hostilities with the Dutch were formally renewed in 1665, and it will be seen that in the 1670s, after the third Dutch War, the nucleus of a uniform battle fleet was formed by the building of the first true ships of the line.

The Dutch themselves, having started this first war with only two ships of sixty guns, built more powerful ones in the course of it. In this effort to reach some sort of parity with the British in heavily gunned ships, pressure seems to have been exerted upon the East India Company, for two of a batch of 70-gun ships were East Indiamen.

Beyond the adoption by the British of a continuous line ahead, if this was done at that time, the main tactical lesson of the war had been that the fleets had been too big and too mixed for tactics. The age of formalism was yet to come, and many of the mêlées seem to have been brought about because British ships, or groups of ships, if to leeward, did not hesitate to break through the Dutch formation. They were more cautious if they held the weather-gage, because ships that then broke through might be cut off while beating back against the wind to rejoin the main body. It was the Dutch who were usually to leeward, and best placed to discontinue an action; and towards the end of the war they were employing defensive gunnery tactics later highly developed by the French, firing high, or on the upward roll, to damage their opponents' spars and rigging.

4

What has been said of this first Dutch War applies to the next two; the fleets were as big and as unmanageable, and tactics discernible at the opening of an engagement invariably dissolve into the familiar series of mêlées. Before the third war the Duke of York, as Lord High Admiral, laid down certain fighting instructions that were to have an injurious effect upon British tactics in the future, as that a fleet was to engage the enemy in a methodical order, van to van, centre to centre, rear to rear, and, by Article XVI, that 'the commanders of his majesty's ships are to keep the fleet in one line, and (as much as may be) to preserve that order of battle which they have been directed to keep before

the time of fight.' Here is envisaged the formal type of battle that was to become tediously common in the next century; but in these Dutch wars, owing to the huge size and mixed composition of the English fleets, it was an impossible ideal. The enjoined order could be maintained, and that imperfectly, only while the fleet was bearing down upon the enemy; one of the English commanders, Prince Rupert, observed that as soon as action was joined he could control only his own ship. In these conditions it seems probable that the Dutch gained some advantage by maintaining their old formation of squadrons manoeuvring independently.

As if the fleets were not big enough already, each side now had in turn some slight assistance from a French squadron. It may be summed up in the words of a French historian as 'demonstrations sufficient to save the honour of the Royal flag'.

The second war began badly for the Dutch. Off Lowestoft, in June 1665, failure to pursue their beaten fleet cost the Duke of York his only command at sea. Twelve months later, after three days' desperate fighting with de Ruyter's greatly superior fleet, Monk was reinforced by Prince Rupert, and on the fourth day the Dutch slipped away in a fog. Within two months they were again defeated. They took an ample revenge, however, when a disastrous decision to lay up the English fleet in the spring of 1667 brought de Ruyter up the Thames in June to force a passage into the Medway and inflict on the Royal Navy, as it was then officially styled, the deepest humiliation it has ever suffered. Four second rates and as many third rates, unmanned and dismantled at Chatham, were burnt or towed away, and the scuttling of three more third rates, prizes from the first war, in a vain attempt to block the Medway, without counting other losses, made this shameful affair more costly to England than any battle.

The third war, which began early in 1672, has been described as being on our part piratical, and on balance the Dutch were deservedly the gainers. They were the victors in the most furious battle, fought at Solebay in May of that year. It saw one of the few major successes by fireships in a fleet action. The new *Royal James*, of a hundred guns, was grappled by a fireship and destroyed.

5

The *Royal James* was one of five first rates, carrying ninety-six to a hundred guns, then in the Navy List. There were eleven second rates, of from seventy-six to ninety guns, and eleven 60- or 70-gun third rates. Twenty years earlier, at the start of the first Dutch War, the large fleet of the Commonwealth included perhaps ten ships in these three rates, the predominant class in the line of battle being the fourth rate of fifty guns or less. The importance of the Dutch wars in British naval history lies not in the fighting, but in the continuous progress in shipbuilding resulting from its lessons. These twenty years begin the second great period—those immediately before the Armada forming the first—in the development of the broadside warship.

It was the third rate that developed. By the time the wars were over it was clear to everyone that there must be an end of the mixed line of battle, mingling weak ships with powerful ones. When the second war began Anthony Deane had designed the *Rupert*, a third rate of 830 tons and sixty-six guns. Launched in 1666, she was much admired, and an identical ship, the *Monmouth*, was completed in the following year. The 66 might have become the standard third rate in the British navy of that time but for the visit of the French squadron to the Thames in 1673, when the 70-gun *Superbe* was so highly thought of that the *Harwich*, of 990 tons and the same force, was copied from her design. The final step was taken in the years 1678 to 1680, when no fewer than twenty 70s were built, all of rather over 1000 tons. Now, at last, there was the powerful nucleus of a homogeneous battle line.

For some time it was to be no more than a nucleus. Fleets continued to be over-large and mixed until well into the next century. But the principle of a uniform line was established. In the early 1690s fifteen third rates of about 1200 tons were given eighty guns, but before 1700 the 70 had come back into favour. Given four more guns, and increased tonnage, she was to be the standard ship of the line for a hundred years.

Though British ships were still overgunned, in James II's short reign a curious aberration caused first rates to be given batteries even heavier than normal. The 100-gun *Britannia*, of 1700 tons,

carried 63- and 42-prs. on her lower deck. Sixty-three-pounders, if not specially cast, must have been siege pieces, the old double cannons. Ships burdened with them would sail more heavily than ever, and they seem soon to have been discarded; and though the navy had not done with 42-prs., which for the same reason, their weight, were never popular, the 32-prs. were again almost universal on the lower deck in Queen Anne's time.

Another form of siege piece had in the meantime gone to sea. Armies had dragged mortars about with them for two hundred years before the navy had its first bomb-vessels. Ketch-rigged, of shallow draught, they mounted a large mortar before the mainmast, in the space where a foremast would have been. The forestay of the mainmast was made of chain, to resist the powder that flew about it from the mortars. These were embedded upon a solid mass of oak resting on the kelson, their wide bore narrowed to a step upon which the huge shell, or bomb, rested, its curve, in which was a time-fuse, projecting beyond the muzzle. The fuse was lighted, and the 13- or 15-inch bomb rose spinning in a very high trajectory to fall vertically on its target. This might be a fort, but bomb-vessels could be employed against ships sheltering in harbour or in shoal water, when the effect of a single hit, since a bomb would crash through decks and even through a ship's bottom, could be disastrous. The old-fashioned bomb was last used in naval warfare, and then on a considerable scale, in the American Civil War; but the principle of the weapon, the high trajectory and vertical fall of the shell, was to be most fearfully illustrated by the modern high-angle, long-range gun, as we learnt at Jutland, and when a salvo from the *Bismarck* destroyed the *Hood*.

Among improvements introduced in the navy after the Restoration were new systems of sheathing—by sheets of lead, fastened with copper nails, and by a more satisfactory process called 'studding', broad-headed nails being hammered close together over a ship's bottom and covered with a compost of tallow and resin. These methods helped to preserve timber, but until the invention of copper sheathing a hundred years later, ships continued to foul very rapidly. What may perhaps also be called an improvement (it was at any rate well-meant) was designed to mitigate one of the more horrible effects of naval warfare before

the days of armour. The hail of splinters in a wooden ship in action made gun-decks look like a shambles. They became so slippery with blood that they were sanded, and a rather grim innovation at the end of this century was the painting of the inner side of the ship along the gun-decks, and even the gun-carriages, a dull red to conceal the blood-splashes.

CHAPTER EIGHT

King Log and King Thumb

1

IN naval history the eighteenth century really begins with the departure from Brest in March 1689 of a French squadron conveying the exiled King James II to Bantry Bay, and it extends to the Hundred Days of 1815, during which H.M. 74-gun ship *Rivoli*, taken from the French, captured the 40-gun frigate *Melpomène*. The almost constant theme of these hundred and twenty-six years is war between Great Britain and France, carried on predominantly at sea. From time to time the Royal Navy was engaged with the fleets of other powers, but France was throughout the enemy-in-chief, and off and on we were fighting her for half of the period. In the intervals between formal wars, peace was often only nominal. The French navy, its ships and its methods, were the preoccupation of generations of British naval officers.

From its ships we had a lot to learn. Outwardly, in the eighteenth century, the men-of-war of European naval powers looked very much alike; had some such work as *Jane's Fighting Ships* been then on the market, in contrasting French and British types its silhouettes would have shown only minor differences in outline and in the cut of the sails (whence recognition by 'the cut of his jib'), while its plans could have conveyed no real idea of what will become a rather depressing refrain—the gulf between good and bad design. There were, however, other points of comparison to be briefly noted.

Mathematical ways of arriving at tonnage were in use by the middle of the seventeenth century, but every maritime country still had its own standards of measurement. As in the days of the Armada, these continued to lead to some confusion. The French *tonne*, for example, weighs forty pounds less than the English ton, but as the French calculated tonnage on principles quite different from ours, in practice the balance was more than

redressed. Rate for rate, French ships were longer than British ships, broader in the beam and deeper in the hold, and were consequently of bigger tonnage. In Pepys's time a French 100-gun first rate was a vessel of 1700 British tons, compared with the 1550 tons of a British first rate. An Ordinance of 1786 laid down the dimensions of each French *rang* or rate: the burden of a 120-gun ship was 2500 tons; of an 80, 1804; of a 74, 1473 tons. When, in a few years' time, prizes from these three classes were added to the Royal Navy, and the figures converted to their British equivalents, the 74s became ships of about 1800 tons, and the 80s of 2240, while the 120-gun *Commerce de Marseille* appeared in our list as a giant, by our current standards, of 2747 tons. It was the same in the frigate class; a French 36-gun frigate, armed with the same number of 12- or 18-prs. as a British 36, would be the larger, according to our measurements, by a hundred or a hundred and fifty tons.

Another cause of some misunderstanding, not adjusted by conversion, arose from the terminology of ordnance. Prizes could be taken into our service, but not their guns. We had not the shot to fit them. All European powers employed similar classifications for artillery, based on the weight of the round-shot fired, but again no two systems of weights and measures were the same. Compared with most foreign pounds and inches, the British pound is heavier, but the inch is shorter. The French 36-pr. gun was so-called because its shot was supposed to weigh thirty-six French *livres*, which are lighter than our pounds; but the calibre of the gun being rather more than six and a quarter French inches, equalling seven of ours, its shot weighed thirty-nine British pounds. Spanish shot was only slightly heavier than ours, but forty of our pounds went to the shot of a Danish 36-pr. Our standard heavy gun being the 32-pr., the fourteen to a broadside of a British 74 discharged four hundred and fifty pounds of metal, a hundred pounds less than a French 74 fired from her so-called 36-prs.; and as with lower-calibre guns there was also an excess in the Frenchman's favour ranging from nearly two pounds to a few ounces, in a full broadside her superiority in fire power over a British ship nominally of equal force was in fact considerable.

2

The fleet taken over by William of Orange included, as has been noted, the nucleus of a uniform line of battle—twenty-two 70-gun third rates, and an odd 74. It was, perhaps, because this class was found to be still inferior to French ships of the same rating that the crop of 80-gun three-deckers was laid down between 1692 and 1697. They were classed as third rates, and so, at the other end of the scale, were Deane's *Rupert* and *Monmouth* of sixty-six guns. Fleets continuing to be very large, fourth rates were still prominent in the line but 48s were now the weakest of the class, and a dozen 60s were added in this reign, ships of over 900 tons, considerably bigger than Deane's thirty-year-old 66s. Three 100-gun first rates were built, or rebuilt, and a big jump in tonnage from the 1650 tons of the rebuilt *Queen* (ex-*Royal Charles*) to the 1880 of the *Royal Sovereign*, launched eight years later, may again have been due to the example set by the French, who by 1700 were building first rates of 2000 British tons.

British flag officers were now, almost without exception, seamen. Mostly they were men of a new stamp, who owed nothing to social position or influence. But though they had fought their way up, often with distinction, through two Dutch wars, few proved themselves fit for high command. More might have become so had not the dead hand of the Duke of York's Fighting Instructions, stiffened by Rooke, crippled initiative.

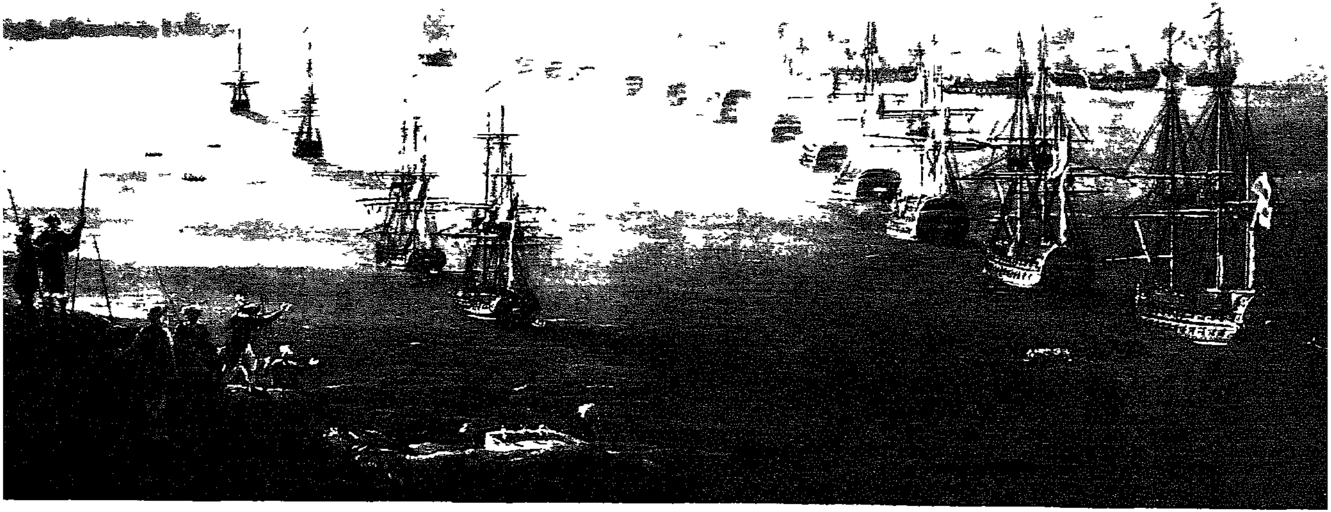
Many of the Instructions, being the result of experience, were practical and necessary—those, for instance, designed to supplement the very limited range of orders which a fleet commander could then communicate by signal. Others attempted to ensure that the commander really did command; his fleet must be an entity, not a collection of semi-independent units, and every ship in it must look to him for such orders as he was able to give. But the Dutch wars had shown that with very large fleets this was an impossible ideal, and by the time they were reduced to a manageable twenty or thirty fairly homogeneous sail of the line every clause in the Instructions had become official and permanent, an edict from the highest authority, the Admiralty, and rigid obedience to the most hampering was a habit of mind.

The line of battle was sacred; whether a British fleet was to windward or leeward of the enemy, it must keep a parallel course in that formation, ship opposite ship, so far as was possible. 'To every man his bird,' the phrase went. No ship, even if badly damaged, could leave the line without the admiral's permission, though he might be a mile away and invisible in the smoke. Gaps in the line must be instantly closed, regardless of the local situation. A result of this formalism was that the once much-desired weather-gage was a wasted asset; it might enable a British admiral to force an action, but that was all. Once engaged, he was a slave to the Instructions. Only if the enemy took to disorderly flight—an unlikely contingency unless they were in greatly inferior force—was he permitted by Article XXV to signal a general chase, and thus break the line.

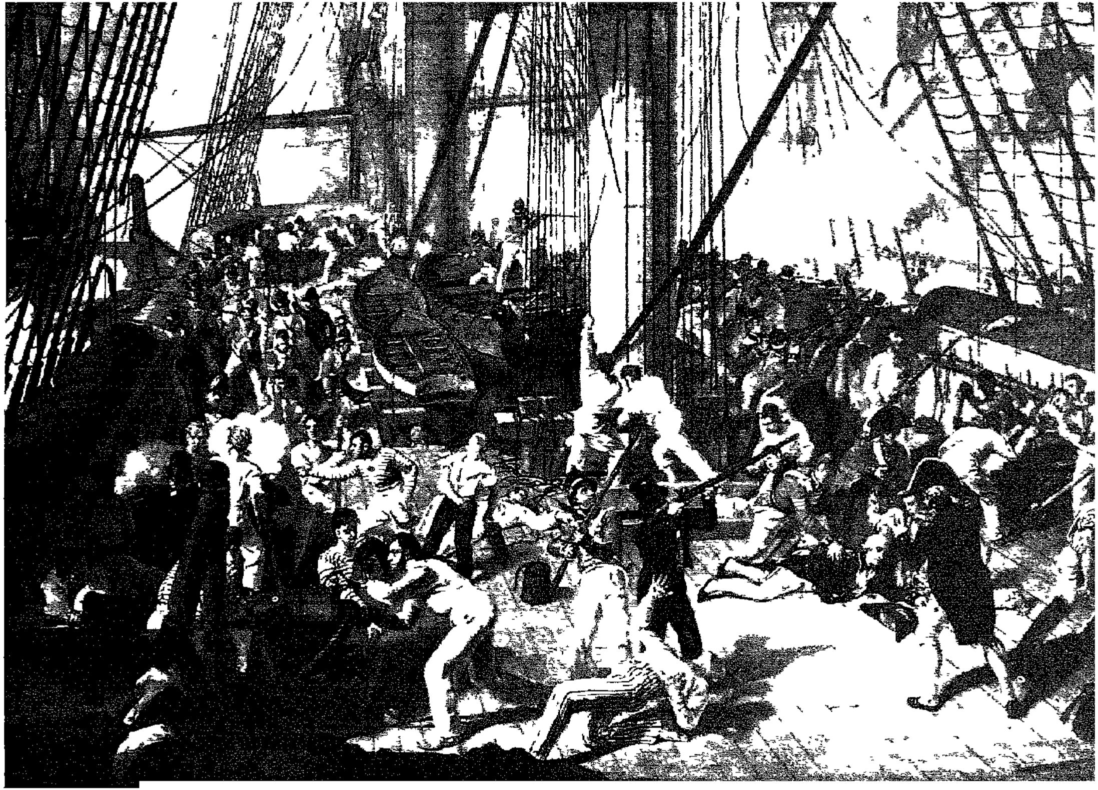
The French navy, at this time, had the advantage that it was neither hampered by rigid instructions nor involved in such party politics as for nearly a hundred years were also to bedevil the British armed services. But it had other troubles, including a restrictive doctrine of its own.

The maritime population of France, almost confined to the coasts of Normandy and Brittany, was much smaller than that of Great Britain. The country being able to live on its own resources, with a relatively small overseas trade, it had not the large reserve of mercantile seamen upon which the British navy could draw in wartime. The needs of its navy, in any case, though the ships were the finest in the world, were always secondary to the demands of the biggest army in Europe. Even the enterprising individualism of the French was a hindrance when it came to manning a fleet; Normans and Bretons preferred to wage war in their own way, and made so great a success of it that the government for long encouraged privateering at the expense of the regular service. This could have done with commanders of the stamp of Jean Bart, Forbin and Duguay-Trouin.

Like the French army, it was a royal service in the strictest sense. It owed its allegiance to the crown, and its officer corps, as in the army, was drawn almost wholly from the *noblesse*, who stood upon their privileges and held themselves apart from the rough sailors they commanded. Though they had a professional training as cadets in marine companies ashore, the haphazard



The Battle of the Nile, 1 August 1798. This oil painting by N. Pocock shows how close to the shore the French fleet anchored.



Nelson mortally wounded at Trafalgar, 21 October 1805 This oil painting by D. Dighton shows how the almost complete closing of the once open waist of a ship of the line produced what was virtually a flush deck from quarterdeck to forecastle. Compare with the *Britannia* of 1719 (facing p. 34)

British method of casting schoolboys upon the waters to learn their job there as best they could, produced far better practical results. The reforms which Colbert and his son pushed with immense energy worked wonders with the French navy, but from the point of view of flag officers they had one very mischievous feature—the undue power given in all branches of the service, even in the fighting branch, to civilians. Civilian *intendants* now not only handled the civil work of fleets at sea, but sat on councils of war and sent secret reports on the conduct of operations.

Always short of trained seamen, and watched by these spies on their flagships, it is not surprising that French admirals played for safety. This mood was rationalized in the theory of the ulterior objective for which the fleet must be preserved, a doctrine as pernicious as the most hampering of our own Fighting Instructions. Since a French fleet must always, in Torrington's phrase, be a fleet in being, ready to fight another day, its aim in battle with a British fleet of equal force was not to destroy it, but to cripple its power to close or pursue by damage aloft. To further ensure that an action could be broken off at will, French admirals (like the Dutch) preferred the leeward position and perfected the manoeuvre of turning their ships away together to run out of range, knowing that their opponents, bound by the Instructions, must keep their linear formation.

There resulted an absurd state of things which endured for nearly a hundred years. While the commanders on one side were obsessed by the idea of the fleet in being, and suffered from what would now be called an inferiority complex, those on the other side were slaves to regulations that rendered them equally unadventurous. In both navies there were, of course, bolder spirits who rose to such opportunities as came their way; Russell and Rooke and Shovell had their moments, and were succeeded by Anson and Hawke and Boscawen; Tourville, at the beginning of this long drab period, and Suffren at the end of it, showed that French admirals could be offensively minded. But in a whole series of inconclusive battles the opposing tactical theories merely cancelled each other out.

3

For the greater part of the eighteenth century it was a comfort to the average French admiral, in the cautious frame of mind in which he prepared to meet a British fleet, to know that he could almost certainly outsail it. British admirals, on the other hand, too often grasped at this excuse to explain why they had so little to show for a nominal victory.

Complaints of the inferiority of our ships, and not only in sailing qualities, to those built both in French and in Spanish dockyards, were all too well founded; and that for so long so little was done to remedy admitted defects is a discreditable story. In the relatively short reign of William III the Royal Navy was more than doubled and had become the most powerful in the world, mustering at his death, in March 1702, a third of the naval strength of Europe, and equalling the fleets of France and Holland put together. This heavy shipbuilding programme might at the time account for a neglect of quality in the interest of quantity; but though the war had clearly shown up the faulty design of our ships, things were no better afterwards. Attempts to introduce improvements, in themselves quite inadequate, were not maintained. In 1706 and again in 1719 the Admiralty laid down establishments increasing the dimensions of the various rates. The increases were petty enough—by the 1719 Establishment, first rates were to be nine feet longer and given another three hundred and nineteen tons, while the enlargement of third rates, the backbone of every fleet, was merely nominal. One foot was to be added to the length of a 70-gun ship, six inches to her beam, and sixty-nine tons to her burden.* But even improvements more appropriate to a new type of stage-coach than to a ship of the line were not adhered to. The last word was with the master shipwrights at the royal dockyards. At all times they worked by rule of thumb, as their fathers and grandfathers had done (the calling still ran in families), so that half a dozen ships of the same class and specifications, laid down in the same year, might vary considerably in their dimensions, and only lip service was paid to establishments. Many of the best ships in the service were built in private yards.

* J. Fincham, *A History of Naval Architecture* (1851).

In France and Spain, even in Russia and Sweden, on the other hand, naval architecture was being studied on scientific principles. Learned works on the subject poured from French presses. Jesuit seminaries were turning out mathematicians like Father Pardies and Father Hoste, who demonstrated geometrically the mechanics involved in the proportions and character of ships, the forces that act upon masts, and the action of waves upon the hull. The Société Royale des Sciences gave prizes for the best treatises, and controversies among the theorists went on for years in the *Journal des Savants.* What was more to the point, under the Colberts these theories were tried out in French shipyards, and from then onwards the scientific school of naval construction was in control. By the third quarter of the eighteenth century the subject was engaging the minds of some of the contributors to the famous *Encyclopédie*, Condorcet and d'Alembert among them. The Encyclopedists are held to have prepared the ground for the Revolution, when egalitarian ideas were to ruin the French navy, but the tradition of building fine ships was so well established that in this respect it continued to hold its lead, and even to increase it, over all others.

Some of these writings were translated into English, but they carried no weight with the all-powerful British shipwrights, even if the latter understood them. It was said of this class that its prejudices against scientific theory appeared 'to have risen almost to a species of mania';* and under this rule of King Thumb our ships continued to be built in the old haphazard way.

Their main faults throughout the century were these. They were too small for the batteries they carried, which was one of the causes, though not the most fundamental, of the indifferent sailing qualities so often complained of when French ships showed us their heels. Ours, again, were notoriously crank, given to pitching and rolling, and heeling over so far in a wind that the lee lower-deck ports could not be opened. This tier was too near the water and repeated injunctions to raise it were disregarded. Rough and ready calculations, rather than obstructiveness, may here have been at fault; and our shipwrights were not wholly to blame for another grave defect, the weakness of our ships' scantlings— that is, the standard sizes of the hull's timbers. Economy was enforced

* J. Charnock, *A History of Marine Architecture* (1801–2).

from above, partly for its own sake, partly because of a growing shortage of suitable oak. An oak tree takes at least a hundred years to reach a size that will provide the big timbers of a large ship, and two thousand oaks, five hundred acres of woodland, were required to build her. There being no state policy of afforestation, planting lagged behind the increasing demands of the navy. In the middle of the century things became so serious that inferior oak began to be imported from Central Europe, as it was later from Canada. For masts and spars, cordage and oil, we were greatly dependent upon the coniferous forests of Scandinavia, a trade so vital that it had to be protected in time of war.

France, in this respect, was in the happy position of having all the timber, of every kind, that she wanted, and a system of forestry control, dating from the early years of Louis XIV and in force today, made provision for the future. The stout build of French ships enabled them to take enormous punishment—a quality shared by Spanish ships. Stoutness of build increased tonnage, but French men-of-war were designed on an ampler scale than ours for other reasons. Weight of armament in relation to tonnage was worked out on mathematical principles. French prizes being by our standards undergunned, we often put more guns into them, to the detriment of their sailing qualities. It was science applied to the design of the hull, however, that made these ships such good sailers—a long keel, fine underwater lines, and a high ratio of length to breadth, which in the biggest classes sometimes approached that of a frigate. Deep holds, at the same time, made for stability.

French ships gained other advantages from their superior size. Lower-deck ports were higher above the water than in our ships, and the guns could be fought in weather that compelled us to keep our ports closed. Longer gun-decks gave more space for the men who had to live there and fight the guns; with fourteen or sixteen guns to a side, an extra foot to a foot and a half per gun meant valuable elbow-room in action.

From the start of the French wars these excellent qualities brought home the shortcomings of our own ships. Circumstances gave particular notoriety to a humiliating lesson in 1708. A small squadron under Forbin, attempting to land the Old Pretender in Scotland, was intercepted by Sir George Byng's fleet of forty sail.

This was easily left behind, the only ship Byng could overtake being an ex-British 48, recently captured. It became a rather bitter joke that the only French ships we ever captured in a chase had been captured from us; and it was after this, 'in consideration of the general inferiority of British ships of war in comparison with those of France',* that the Admiralty worked out the Establishment of 1719, a labour that produced a mouse. Definite instructions and practical object lessons made as little impression on the real rulers of our shipyards as scientific treatises in foreign tongues.

Twenty years later, a more telling jolt was received from an unexpected quarter. In 1739 we went to war with Spain, whose navy our officers held in some contempt. That year three of our 70s managed after a long chase to overhaul the Spanish *Princesa*, nominally also a 70 but carrying only sixty-four guns. It took our three ships nearly six hours to batter her into submission, the action exposing forcibly every defect in their design.

Their officers and men could be counted upon to get the most out of them, while Spanish crews were ill-trained and slow, but it was only with difficulty that the *Princesa* was overhauled. Our 70s then ranged from 1100 to 1250 tons, their gun-decks being at most a hundred and fifty-four feet long and their beam round about forty-two feet. The *Princesa* was a ship of over 1700 of our tons, with a beam of nearly fifty feet and a gun-deck of a hundred and sixty-five feet. She stood up to the weather, which was stormy, and her lower-deck guns being high out of the water she was able to work them when our ships had to close their lower-deck ports. She carried 36-prs. to the latter's 32-prs. Because of her stout build she endured punishment that must have reduced any one of them to a wreck in an hour.

She was considered so fine a ship that in one of our spasmodic efforts to make up leeway in naval construction her design was used as a model. It was typical of the times that her dimensions were thought to be wildly excessive for a third rate, and they were accordingly adapted to a first rate, the 100-gun *Royal George*. Though of 2000 tons, this ship was only thirteen feet longer and two feet wider in the beam than the Spanish 70.

* J. Fincham, *A History of Naval Architecture.*

4

The *Royal George* herself, the second of the name, is still remembered, thanks to the poet Cowper. Completed in 1756, she sank in Portsmouth harbour in 1782, drowning some six hundred persons, among them Admiral Kempenfelt, an exceptionally able officer. It is now thought she was lost because, while slightly careened for a minor underwater repair, either she was heeled over too far or stores in casks being hoisted on board were allowed to accumulate on deck until her open lower ports were forced below water-level. Her fate may be recalled here because the long-held belief that under the strain of careening her rotting bottom timbers fell out, derived from knowledge of the neglect and inefficiency that throughout the eighteenth century went hand in hand with out-dated methods in our royal dockyards. It was not a new story; the Tudor régime of Hawkins was succeeded by fifty years of sloth and corruption, and after vigorous reforms during the Commonwealth and Protectorate, when the Admiralty was controlled by the omnipotent Parliamentary Committee of Both Houses, the later years of Charles II's reign saw another decline, in spite of good work by the Duke of York and a few honest subordinates like Samuel Pepys. The duke had little time in his own short reign to attend to the administration of the navy, and William III, constantly abroad, had to leave it, with other English affairs, to the politicians who had put him on the throne. The results were to be felt in the ports and shipyards even more disastrously, and for longer, than they were at sea.

There was no proper supervision of the dockyards. In the absence of any school of naval architecture, and of any scientific study of the subject except by a few civilians with little influence, the Board of Admiralty, as a body itself elderly and conservative, in laying down successive establishments for the navy relied for technical advice upon the yet more conservative master-shipwrights. The latter were then left to their own devices, not only in the interpreting of instructions but in the day-to-day running of the machinery that carried these out—or did not, as the case might be. At every dockyard, it was true, the Board was represented by a Commissioner, who was a senior naval officer, but

this administrative post being regarded as a dead end, it was one for which the right type of man could seldom be found. Dockyards were never inspected by the ultimate authority, the Board itself, until Anson ordered a visitation to be made in 1749. A deplorable state of things was then reported—idleness and ignorance everywhere, abuses rampant, stores ill-arranged and often decaying, ships in ordinary dirty and in bad condition. To all this the Commissioners had turned a blind eye. There was not another visitation for twenty years, and though thenceforward these inquisitions were supposed to be made regularly at short intervals, slovenliness and petty corruption prevailed until the next century, when St. Vincent, as First Lord, forced through Parliament an Act appointing Commissioners to inquire into 'irregularities, frauds and abuses in the Navy Departments'. The admission at this time of shipwright-apprentices to the long-established Royal Naval College at Portsmouth was the first step towards a school of naval architecture. But the wars were over before reforms produced their full effect; and since for so long inefficiency, and worse, was the rule in His Majesty's dockyards it is not surprising that the ships built in them were often as defective in construction as they usually were in design, or that many were rendered unfit for service, and some perished, through sheer neglect.

CHAPTER NINE

The Line and the Frigate

1

THE middle years of the eighteenth century when the *Royal George* was being built, saw navies beginning to assume the characteristics made familiar from the vast literature on warfare at sea in Nelson's time. The 74-gun ship was adopted as the standard medium class of third rate, and the frigate emerged in its final form as a fast cruiser carrying its main battery on one deck and designed for scouting and commerce raiding.

Battle fleets were going through the process of shaking down from a collection of oddments into distinct and more or less uniform classes. It was recognized that the fewer of these there were in the battle line the better. As long, however, as very large fleets remained in vogue, the line included all four higher rates. In the British navy, in mid-century, the most powerful ships in these rates still carried a hundred, ninety, seventy and fifty-four guns.

As the century drew on, that navy had to find squadrons for distant stations all over the globe, from the Mediterranean to the West Indies, North America and the Coromandel Coast. There were constant and increasing demands for ships of the line to escort large fleets of merchantmen out of the Channel. A high proportion of ships on the active list—from one-fourth to over a third—was always in dockyard hands, refitting or under repair. Such a fleet as Russell's at La Hogue, in 1692, sixty-two sail of the line, was not again to be seen in battle, and in the next century only one of anything like that size ever put to sea. In the Narrow Seas an admiral was soon lucky who had a battle fleet of twenty. From now onwards the navy's burdens continued to increase, and seventy years after it thought it had done with auxiliaries it was again to find it necessary to include a few East Indiamen and a number of small mercantile craft for convoy and patrol duties.

With the era of small fleets the time had come for the uniform

battle line—a homogeneous string of third rates stiffened by one or two three-deckers acting as flagships. Such a line had no weak links, and was simple to handle. In the British navy, however, it remained an ideal very seldom attained. Even the third rate, in which uniformity was most desirable, suffered from the old evil of multiplicity of types; there were five in mid-century, ranging from 80s to 64s, and there were never to be less than four. Sixty-gun ships had by then been officially removed from the line, but were often found in it, as were the little 50s, relegated from the fourth to the fifth rate many years before. To add to the general untidiness, 64s of this period were pierced for seventy guns, but may or may not have carried the extra pieces, while 50s were often given fifty-four or fifty-eight guns, and before long had been restored to the third rate. The French, on the other hand, from the beginning of this era aimed at a more uniform line of battle. At Quiberon Bay, Hawke's twenty-three sail of the line ranged from one 100-gun ship to five 60s; Conflans's twenty-one from 80s to 64s.

It was at this period that the Board of Admiralty was dominated by Anson. The new spirit he instilled into operations at sea was among the causes of the execration heaped on Admiral Byng. Anson himself, while on the Board, had shown how things should be done; in 1747, with a much superior force, he captured de Jonquière's six sail of the line and his three heavily armed merchantmen. If he had not been Anson, and if the victory had not been thorough and much needed, he might, like Byng, have been court martialled. De Jonquière pluckily forming line to fight, Anson ordered a general chase without even making the gesture of forming line himself, thus doubly defying the sacred Fighting Instructions. Since for this he got a peerage, the example encouraged officers of the same stamp, and later in the year Hawke beat de l'Etenduère in similar dashing style. The Instructions were to be a clog on the navy for a long time yet, but Anson's work at the Admiralty was to have a lasting effect on the discipline and efficiency of the service at sea.

He was less successful on shore. The visitation of the dockyards, earlier referred to, was merely one feature of a thorough overhaul of naval administration. Here, however, his reforms did not long outlive him.

2

Though even Anson could not shake the vested interests in the royal dockyards out of their rut, from time to time the master shipwrights' hands were forced by the capture of some French or Spanish ship of exceptional merit; but after a brief concession to service opinion, mainly expressed by officers below flag rank who hoped to command these prizes, which were much sought after, as were new ships built to their design, the old ways of King Thumb were resumed. The process is well illustrated by the history of the 74 itself, of which class the first were on the stocks in Anson's early years at the Admiralty.

It was another case of copying the French. At this period the latter had stopped building three-deckers; instead, larger types of the 80- and 70-gun classes were designed and given four more guns. The new 84s proving no match for our first and second rates, three-deckers came back into favour, as did the powerful 80-gun class, always popular in the French navy. The 74, however, was retained, to be adopted by other navies besides our own as the most serviceable medium type of battleship.

In 1747 we captured the 74-gun *Invincible*. A beautiful sailer, she was a ship of 1800 tons, and under what, one feels, must have been considerable pressure, Woolwich dockyard built an almost exact replica, the *Triumph*. An advance of two hundred and fifty tons on the burden of our few 74s already built was, however, too good to last. The *Triumph* was not launched until 1764, after Anson's death, and whether or not the coincidence is significant, the tonnage of her immediate successors fell to 1650, 1600 and 1550 tons. For the class it was to remain round about these figures until the end of the century. British-built 74s of the dimensions of the *Invincible* and *Triumph* would not have been seen again until after Trafalgar if private shipyards had not been more enterprising than the royal establishments. In the 1790s, when the same spirit had begun to infect the Board of Admiralty itself, orders were placed with private yards for no fewer than seven 74s. Launched in 1798, all but one were of 1900 tons or more. In the meantime two more had been laid down that were to provide a striking object lesson on the comparative method. The only ships

of the class completed in 1800, the *Courageux* was built at Deptford, a royal dockyard, and the *Spencer* at a private yard—to the design, incidentally, of a French shipwright. In tonnage on the increased scale, and in capabilities, they should have been much alike. The *Courageux*, however, was a ship of only 1772 tons, compared with the *Spencer*'s 1917; the latter, broader in the beam and deeper in the hold, proved perfectly satisfactory, whereas the product of rule of thumb calculations at Deptford, having had her inadequate copper sheathing raised, was then found to be so uneasy at sea that her poop had to be taken off, as had that of a sister ship launched the next year.

The history of French ships of this class is very different. So excellent were the first French 74s, built before 1750, that only minor increases in tonnage and improvements in proportions are found in later designs. The tonnage of the captured *Sceptre*, built about 1778, and of the *Puissant*, brought away from Toulon in 1793, was virtually the same as that of the old *Invincible*. Built sixty years after the latter, the *Scipion* and the long-lived *Duguay-Trouin*, which escaped from Trafalgar but were captured soon afterwards, were only some fifty tons bigger and a few feet longer. Like almost all French prizes that were not battered into wrecks, they were gratefully taken into our service.

An authority on the Royal Navy has said of these wars with France that 'the origin of nearly every one of our improved types can be traced to some French prize', and he adds that after the Revolution 'French pre-eminence in design became even more definite'.* We had by then come to accept this state of things, but it was mortifying to find that the Spaniards, whose navy, since we last fought it, had sunk to new depths of sloth and unreadiness, could still build better ships than ours. British shipwrights had a hand in building some of them, for many younger men, frustrated by restrictions and antiquated methods at home, had by now drifted abroad, chiefly to Spain. Four Spanish sail of the line were taken in Jervis's victory off Cape St. Vincent in 1797, two of them by Nelson, who having boarded the 80-gun *San Nicholas*, from her deck led his men onto that

* G. S. Laird Clowes, *Sailing Ships, Illustrated by Models in the Science Museum* (H.M.S.O., 1930). Some of the models are now in the National Maritime Museum, Greenwich.

of the 112-gun *San Josef*, a process known as his patent bridge for carrying first rates. All four prizes were superior to any ships of the line then in our service, alike in size and stoutness of build and in their ability to work to windward, even when under jury rig.

With the adoption of the 74, in the British navy as in the French, the 70-gun ship faded from the scene. In time, by the removal of six guns, the survivors were reduced to the 64-gun class. By the end of the century, out of some ninety ships of the line above the 64s, nearly seventy were 74s. This proportion, however, was seldom reflected in a battle fleet, of which the class was designed to be the backbone. There were only seven in Jervis's fifteen sail at Cape St. Vincent. His small fleet, it was true, suffered from a glut of admirals, and in consequence of three-deckers, but at Trafalgar, where there were fewer admirals in a fleet of twenty-seven ships, only fifteen were 74s. The class had become maids of all work, and the well-balanced line of battle was still a rarity.

Above the 74s in the third rate were the 80-gun two-deckers. The few we built of this class appear to have been a not very successful compromise, but it was enlarged by a number of prizes, chiefly French. These were very powerful ships, throwing a heavier broadside than our three-decked 98s. The *Sans Pareil* and *Juste*, taken on 1 June 1794, came within a few tons of the 2280 of Howe's flagship, the *Queen Charlotte*, and were several feet longer; the *Juste*'s length of a hundred and ninety-three feet was not far from four times her beam, the ratio of 1 to 3·84 being high for any class of ship, and exceptionally so for a ship of the line. When, in 1798, we completed the 80-gun *Foudroyant*, she was soon joined by the three 80s of Brueys's squadron, which was all but annihilated at the Battle of the Nile; all three were two hundred tons bigger than the *Foudroyant*, built of better timber, and altogether superior ships. Twenty years later, King Thumb's long reign being over, ten 84s were designed on the lines of the *Franklin*, renamed *Canopus*, and she herself was still in commission in 1850.

First and second rates, three-deckers of ninety to a hundred guns and upward, were valuable assets in a fleet as movable strong points, and provided admirals with the dignity and com-

fort which in all navies they considered due to their rank. When ill-health compelled St. Vincent to retire from service at sea, he deprived his successor in the Mediterranean command of one of our few first rates, refusing to go home in a frigate 'like a convict'; and Admiral Calder, returning to England to face a court martial, was allowed by Nelson, who could then ill spare a 64, to sail in his 90-gun flagship.

The first British ship to carry more than a hundred guns was the 110-gun *Ville de Paris*, named after de Grasse's flagship captured at the Battle of the Saints. Of 2350 tons, she was the biggest ship yet built in a British dockyard, and the first to have a gun-deck of over two hundred feet. In 1793, when she was still on the stocks, one of the largest men-of-war in the world fell into our hands at Toulon. By our measurement, the 120-gun *Commerce de Marseille* was a vessel of 2747 tons, and she was used as a model for a ship of similar force, the 2616-ton *Caledonia*, ordered to be laid down in 1794. The *Caledonia*, however, was not even begun for another eleven years, and granting the pressure of work in our shipyards, it seems likely that other objections had to be overcome.

Such figures of tonnage exceeded what most British shipwrights then considered the limit. Big wooden ships had a tendency to be longitudinally weak, and to 'hog' or dip at the bow and stern. If the proportion of length to breadth was high, the danger of hogging or arching was increased. The displacement of a ship of the line was almost doubled when she had taken on board guns, ammunition, stores and ballast; and in the royal dockyards it appears to have been the view that anything above 2500 tons burden, which meant a keel of at least a hundred and seventy feet, must entail hazardous weaknesses under the full load to be carried. Scientific shipbuilding had solved this problem, as it had solved others, but as long as empirical methods prevailed in our yards there may well have been good reason for caution. Complaints about the ships built in them were to continue almost to the end of these wars, when the end of King Thumb's domination was also in sight—'they were not strong enough to bear the strains they were subject to in a heavy sea, but were constantly working, and there were so many instances of this weakness as to show that it was not the result of anything *accidental* in the

building of them.'* In the 1790s the obstructive powers of the master shipwrights had only begun to be shaken, and long established usage and beliefs may account for the eleven years' delay in putting down the keel of the *Caledonia*. Our first ship of 2500 tons, the 110-gun *Hibernia*, was not launched until 1805, when the building of the *Caledonia* was at last commenced.

The fate of the big *Commerce de Marseille* herself is very puzzling. She was added to the British navy, which needed every ship we could build or capture. By 1800, out of a hundred and twenty-four sail of the line, down to 64s, in commission or in ordinary, nineteen, or nearly one-seventh, were prizes. It was said of this powerful acquisition that 'as she was the largest, so she was the most beautiful ship that had hitherto been seen; notwithstanding her immense size, she sailed and worked like a frigate.'† She was quite undamaged, and was so greatly admired that she was ordered to be copied; yet she was condemned to inactivity as a stationary harbour ship until the short-lived Peace of Amiens, when she was broken up. It is no doubt fanciful to suspect some sinister influence still at work, but her case is the more perplexing because, war having been resumed, the French and Spanish fleets swept from the seas, the *Caledonia* at last completed, and improved methods of construction enforced upon the royal dockyards, we began to lay down 120-gun ships in quite a lavish way. Three, all bigger than the squandered *Commerce de Marseille*, had been launched by 1815.

3

It was not until these wars with revolutionary France and the First Empire that the frigate really got into the news as a dashing cruiser and winner of prize money. During the shaking down process of battle fleets in the first half of the century, the need of a definite class of small fast ships for scouting and raiding purposes came to be recognized in all navies. In ours this class was drawn from the fifth and sixth rates. Hitherto, these had counted for so little that in 1688 they appear to have numbered

* J. Fincham, *A History of Naval Architecture*.

† W. James, *The Naval History of Great Britain from 1793 to the Accession of George IV 1820* (1837).

between them less than a dozen in a total of over a hundred rated ships, and fifty years later the proportion was much the same. A few seem then to have been called frigates; but it was not until after 1750, when Anson was at the Admiralty, that the class as we know it was created by the building of a new type of fifth rate of thirty-six guns, and 32- and 28-gun sixth rates. This considerable batch—thirty-five were afloat by 1760—was the first to be definitely distinguished by the name of frigate, its ratings being relegated to the obscurity of official records.

The 36-gun frigates were ships of 730 tons, having a main battery of 12-prs. The class was discontinued when a few had been built, to be revived with increased tonnage and 18-pr. guns at the same time that a 38-gun class was introduced, after the capture of French and Spanish frigates of both types. Most popular and hard-worked were the 12-pr. 32s, of which a great number were in commission towards the end of the century. By then, under the vigorous if often ill-advised stimulus of revolutionary rule, the French navy again led the way by designing very large frigates nominally of forty and forty-four guns, yet another class which we had to copy.

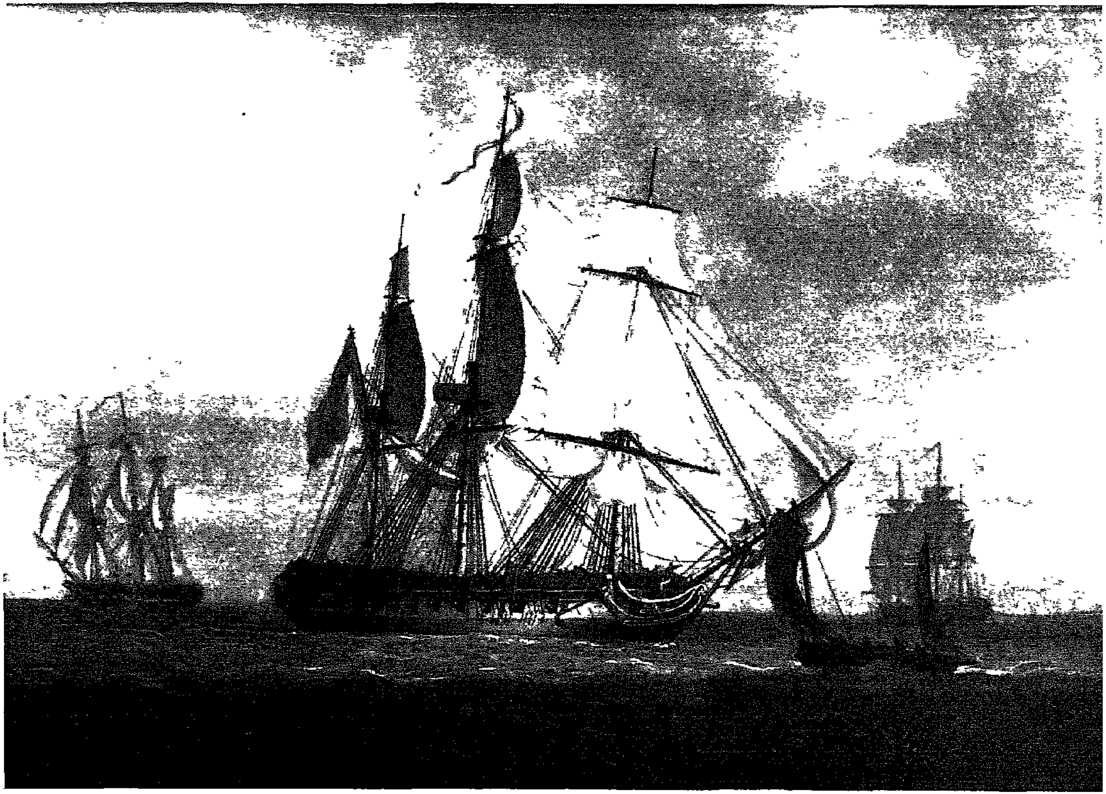
In sail plan and general construction the frigate was a small edition of the ship of the line. She had a forecastle and quarterdeck, but no poop, and her main battery was on the deck below. In the interests of speed, however, her scantlings were much slighter than those of the smallest two-decker. Thirty-two pound shot would beat in her sides, and if one was so unfortunate or so rash as to come within close range of a hostile 74, she was in danger of being sunk by a couple of broadsides, a fate which overtook an imprudent French frigate at the Battle of the Nile. In the hey-day of the class, from 1793 onwards, scores of publicized frigate duels, and such spectacular exploits as those of the *Impérieuse* under Cochrane's command, have tended to obscure the more tedious day-to-day functions for which the type was designed. Many of the single-ship actions came at the end of months of hunting for the enemy's cruisers preying on Britain's enormous seaborne trade. Even more important, in the view of every admiral commanding a battle fleet, was the frigate's role as the eyes of that fleet. If an opposing fleet was at sea, it was her job to find it, and in the era of the long blockades, before and after

Trafalgar, while the blockading fleets kept out of sight below the horizon, their frigates beat to and fro close inshore to signal to 'repeating' ships any move by the enemy in port. Without these scouts a fleet commander was like a very short-sighted man; Nelson's having parted from him in a gale when he was hunting the Army of the Orient in the eastern Mediterranean, he missed the chance for which he prayed of 'trying Bonaparte on a wind'. Want of frigates, he said, would be found stamped on his heart.

Though in that year, 1798, we had upwards of a hundred frigates actually in commission, a total that was to rise in another ten years to a hundred and forty, there were never enough for our needs. The shortage would have been acute had we not taken so many prizes of this class. Out of a hundred and twenty all told in 1800, thirty-seven were prizes, mostly French. It was a class in which French shipwrights naturally excelled, and it was the hope of every British frigate captain to be given command of a French prize. As with capital ships, some of our prizes in this cruiser warfare of the Revolutionary and Napoleonic eras made history when contrasted with the rather flat and unprofitable annals of British shipyards; while these affairs being so frequently single-ship actions, more often than not won against odds, they demonstrate more clearly than the confusion of pitched battles the reasons for the Royal Navy's mastery for a quarter of a century over its chief opponent. The French navy never fully recovered from the early loss by resignation, dismissal or the guillotine of three-fourths of its officer corps. Before boatswains were made captains it had been so different a story that a drawn fight like that between the *Arethusa* and the *Belle Poule* could be glorified in English balladry.

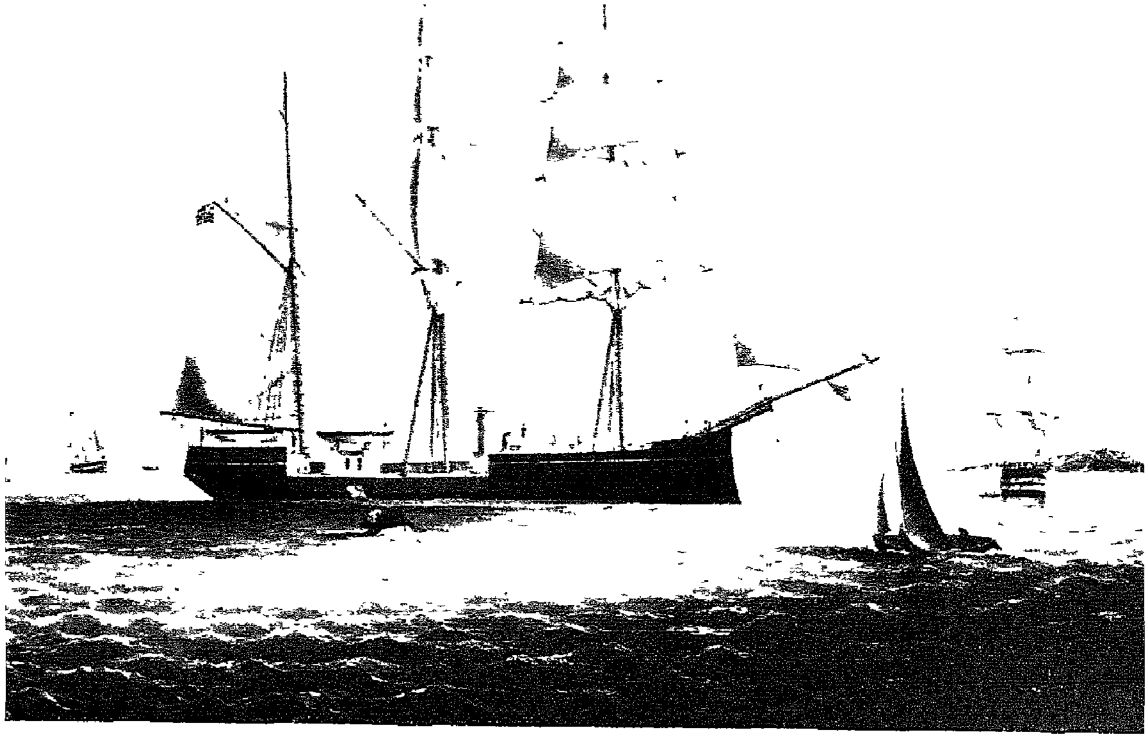
The comparative aspects, just mentioned, of frigate warfare little more than ten years later are strikingly brought out in the case of the *Pomone* and the *Sibylle.*

No frigate of a size to take 24-prs.—the middle-deck guns of a first rate—had been built before the war with revolutionary France. Soon after this began in 1793 we got news of the launching of the 44-gun *Pomone*, carrying twenty-six 24-prs. Since in theory our heaviest cruisers, the 18-pr., 38-gun class, were no match for so powerful a ship, as a makeshift, three 64s were cut down to one deck, or 'razeed', as the phrase went, much of our naval as well



The 32-gun frigate *Triton*, 1796

From an oil painting by N Pocock



H.M.S. *Wivern*. One of the Laird turreted rams built for the Confederate States' Government in 1862-3. In the British navy the *Wivern* was given tripod fore and main masts

From a coloured lithograph by Day & Son after W. E. Atkins

as military idiom coming from France. Then, in 1794, the *Pomone* herself fell into our hands, having lost her main and mizzen masts in an action between frigate squadrons off the Channel Islands. A ship of 1240 tons, she is described as an incomparable sailer, and she caused such a stir that the 24-pr. *Endymion* was ordered to be designed on her lines. It is significant that the order was placed with a private yard.

The *Endymion* proved as fine a ship as her model. By a neat coincidence she was in company with a new *Pomone* in one of the last sea fights of these protracted wars. That with France was ended, and on Christmas Eve, 1814, a treaty was signed with the United States; but the Atlantic, in the days of sail, being rather like Mr. Yeats's Isle of Innisfree, where peace comes dropping slow, sporadic warfare continued on its waters for another couple of months, and early in the new year the *Endymion* and *Pomone* took part in the capture of the American frigate *President*.

In 1794 we also took the 18-pr., 40-gun *Sibylle*, caught at anchor in the harbour of Mykonos, in the Greek Archipelago, by the 50-gun two-decker *Romney*. Before the introduction of the 24-pr. class, these 40-gun French frigates, of 1000 tons or more, were the most powerful afloat, and the *Sibylle* had four carronades on top of her establishment of long guns. Under the White Ensign she was rated as a 38-gun ship, but she carried forty-eight guns—twenty-eight 18-prs., six 9-prs., and fourteen 32-pr. carronades—when, in January, 1799, she was cruising in the Bay of Bengal, looking for an even more powerful enemy than the antiquated *Romney*. The *Forte* was the *Pomone*'s immediate successor in the 24-pr. class, and feeling in the British navy, which had a good opinion of itself, was that the *Sibylle* should not have been sent to hunt her down single-handed. Yet in a night action lasting four hours, which cost the *Sibylle* her captain and four men killed and seventeen men wounded, the *Forte* was reduced to a mastless wreck, her bulwarks beaten in, her boats, booms, capstan and everything else above deck level in splinters, several of her guns dismounted, her decks running blood and strewn with a hundred and forty-five dead or injured. She had three hundred round-shot in her hull, the *Sibylle* no more than six—an extraordinary disproportion after four hours' fighting, mostly at very short musket-range. The British frigate's sails,

spars and rigging were much cut about. One 24-lb. ball went clean through her, an indication of what she might have suffered had the French gunners kept their heads.

As the battered *Forte* was lost on her voyage to England she was never accurately surveyed, but by our calculations she was a ship of about 1400 tons, three hundred tons bigger than her opponent. She had two more 24-prs. than the much-admired *Pomone*, and could throw a broadside of over six hundred pounds to the *Sibylle*'s five hundred. Various reasons were put forward to explain the very poor showing she made; her captain (who was killed) was elderly and weak and her crew indisciplined; so many men were away on prizes that the forecastle and quarterdeck guns could not be manned; the quoins of the 24-prs. had been planed down three days before the action, and the increased elevation given to the guns was not corrected. Granting some or all of these shortcomings, they were not, however, known to the captain of the *Sibylle* when without hesitation he attacked a ship which he knew to be greatly superior in force to his own, and it is this confidence, and its frequent justification, that are most strikingly exemplified in the numerous frigate actions of the time. When Garrick wrote, 'Heart of Oak are our Ships', the oak might be imported stuff of poor quality, and not only British hearts were stout; if we conquered again and again it was because British seamen, professionally speaking, had then no equals. Such victories as that won by the *Sibylle* were triumphs of good training, above all of good gunnery.

We built no frigate of the size and power of the *Forte* for another quarter of a century. During the War of 1812 there was an undignified scramble to design or contrive something that would master the big American frigates; five of fifty guns, carrying 24-prs., hastily built in the Thames, being of less than 1200 tons were overgunned and deservedly unsatisfactory. Sixty-gun two-deckers were disingenuously classed as frigates, and 74s were razeed. It was said at the time that these improvisations should not be needed, that we had plenty of frigates in commission quite capable of dealing with the most powerful American ships. The *Constitution*, which knocked out the *Guerrière* and *Java* with humiliating ease, was exceptionally stoutly built, which accounted for her burden of 1570 tons, and she had a very heavy battery of

carronades, but she threw little more metal from her long guns than big French frigates like the *Forte*, which had become prizes to our 18-pr. class. But between Trafalgar and the year 1812 the lessons of a long roll of such victories had come to be neglected. The outward smartness of paint, polish and drill had taken precedence of gunnery.

CHAPTER TEN

Signals, Sterns and Smashers

1

WHEN Admiral Kempenfelt went down in the *Royal George* he left to be perfected by others a task which was not the least of his services to the British navy—the long overdue invention of an adequate system of signalling. In this task he had the assistance of Howe, who, with other officers, carried it to completion. In France la Bourdonnais had been working on rather similar lines.

The only improvements in the method of conveying orders by signal since the days of the Armada had been additional combinations of flags, and of the positions of flags in the rigging. Combinations and positions meant certain definite orders. The commander of a fleet was severely restricted in what he was able to say to his captains. The system devised by Kempenfelt and Howe—the numerary or vocabulary system—was something quite new. Numbers were given to an alphabet of twenty-five letters, 'I' and 'J' being regarded as one, and by this means a dictionary of a thousand words was made available by variations of three hoists of flags. This first vocabulary book was issued in 1782, the year of Kempenfelt's death. Two more, each containing another thousand words, were issued later. It was now literally possible to talk with flags, almost as freely as in conversation. It will be remembered that when Nelson wished his famous Trafalgar signal to begin with the words, 'England confides', his signal officer suggested that 'England expects' would be better, 'expects' being in the vocabulary book, while 'confides' was not, and would have to be spelt by separate flags.

Kempenfelt was also the author of many improvements in training and discipline. He made uniform a system partially introduced some years earlier—the formation of a ship's company in divisions, each under a lieutenant, who was to be responsible for his division's conduct and well-being. Between them, Kempenfelt and Sir Charles Douglas, who was Rodney's Captain

of the Fleet, or Flag Captain, at the Battle of the Saints, share much of the credit for new methods of loading and firing broadside guns. It was Douglas, an artillery specialist, who caused the old port-fires and powder horns to be done away with, guns being fitted instead with flint locks and priming tubes; he gave guns a wider arc of training, and by his drill increased the rate of fire. He was the Percy Scott of his time, and from this period the broadside fire of British ships acquired a permanent and marked superiority over that of their opponents, whether French or Spanish, Dutch or Danes.

Ever since Richard Hawkins had said, 'The nearer the better', close action had been a tradition in the Royal Navy. Close action meant anything within point-blank range—that is, within the range at which the horizontal trajectory of a shot began to fall. With a 32-pr. this was four or five hundred yards. British ships often sought to engage much more closely than this. French and Spaniards, as a rule, preferred to keep beyond point-blank range, elevating their guns accordingly. For short ranges, with the old-fashioned smooth-bore muzzle-loader, good gunnery meant rapidity of fire. Some measure of accuracy, all that could be expected, was desirable at longer ranges, but in conditions in which highly trained gunners could scarcely miss, the chief aim of English gunnery officers was to reduce the interval between one broadside and the next. In delivering a broadside, a ship of the line did not always fire her thirty or forty heavy guns simultaneously; if she was old, or in poor repair, because of the shock to her frame from such a discharge they were fired in rapid succession. Orders to open fire, on instructions passed down from the upper deck, were originally given by the captains of 'directing guns', but later by gunnery lieutenants, who had to see, before each broadside, that every gun was run out and ready. When guns jumped back on the recoil to the limit their breeching tackles allowed, they had to be swabbed and reloaded and then hauled by their breechings and pushed by their crews up to the gun-ports again. If they were on the lee side of the ship, and she was heeling, their own weight would help the run up, but if she was engaged on her windward side any heel was against it, and meant hauling and pushing them up a slope. Under practice conditions, with the smartest crews the fourteen or sixteen guns to a side on each

gun-deck could not be run out, ready to fire, at the same instant; some would always lag behind the rest, and the shortest possible interval between broadsides, if they were not to be ragged, remained an ideal.

The Spaniards on the ships of the Armada were astonished and dismayed by the rapidity of English gun-fire, but we do not know what the term meant in those days. It is safe to say that the rate of fire must have been very slow by later standards. Batteries being mixed, there was no firing by broadsides; guns were discharged independently, when ready. Broadside fire only began to come in with standardized batteries. But like our preference for close action, the tradition of good gunnery, or relative rapidity of fire, was handed down in the British navy, and in our first major action with a French fleet since the days of Henry VIII, the Battle of Beachy Head, we claimed that our rate of fire was better than the enemy's. What that rate was, however, we can still only guess. It is generally stated that from then onwards French gunners, as a rule, fired more slowly than ours, and Spanish gunners, invariably, much more slowly. In the early years of the Revolutionary wars, when everything in the French navy, except the ships, had gone to pieces, its gunnery could be incredibly bad. A squadron under Admiral Bruix, trying to dispose of an Algerine corsair, fired nine hundred rounds without making a hit. Things improved as it came to be realized that revolutionary fervour was no substitute for discipline and training; but in rate of fire, French gun-crews remained to the end more decidedly outclassed by ours than in previous wars. For the first time we get an idea of what such officers as Douglas and Kempenfelt meant by good gunnery—a smart crew was expected to fire two broadsides in five minutes, and an exceptionally smart one, three. When the long months at sea before Trafalgar brought British fleets to their highest pitch of efficiency, Collingwood's flagship cut this time to three minutes and a half.

For close action there were substitutes for round-shot in the form of case or grape—small shot in tin cylinders or in canvas bags held between circular iron plates by a spindle. Fired from the light forecastle and quarterdeck guns, as they sprayed from their containers, case- and grape-shot smashed the enemy's bulwarks, swept his upper decks and mangled his lower shrouds and running

rigging. It was, however, thought to be rather unsporting of the French and the Dutch to use chain-shot (iron bars or shot chained together) to cripple an opponent aloft.

Gunnery methods, like the guns themselves, were of long standing. It was at this time, when in the British navy the methods were much improved, that our gunners were provided with an entirely new weapon for close fighting.

2

The insatiable demands of the navy, and of the big overseas trading companies, whose ships were heavily armed, not only outpaced the country's dwindling growths of suitable oak, but also exhausted the forests which supplied the Sussex iron foundries with timber for smelting; and towards the end of the eighteenth century this industry moved to Scotland, to Carron, near Falkirk, where there were iron and coal fields. Here was produced the first novelty in a ship's armament since the days of Henry VIII.

The carronade, or 'smasher', was really a revival of Henry's perrier—a stumpy, thin-barrelled gun of very wide relative bore, firing a hollow or cored shot which required a lighter charge of powder than a solid projectile. The biggest carronades were 8-inch 68-prs.; then came 42-prs., 32-prs., 24-prs., and so on, in line with the calibres of standard long guns. But whereas a 32-pr. gun, with its carriage, weighed nearly three tons, and a 24-pr. well over two, the weight of the equivalent carronades was only seventeen and ten hundredweights, so that the lightest 'smashers', 12- and 9-prs., could be mounted on the poop of a ship of the line, which was merely the roof of the captain's or admiral's cabin, and not constructed to carry guns. Room for heavier carronades was found on quarterdecks, and for at least a pair on the forecastle. The *Victory* had two 68-prs. on her forecastle at Trafalgar.

The carronade was most destructive at ranges of a few score yards, when its cored shot, with their low velocity, tore larger and more ragged holes than solid shot in a ship's timbers. Its light weight gave it many advantages, within its range, over the long gun. It did not require the heavy truck carriage; the barrel was fastened by a bolt through an iron hoop on its under side to

a flat timber tray running on small iron truckles or castors, used only for traversing, the barrel itself being so short that a slot down the centre of the tray took the slight recoil. The carronade could be fired more rapidly than the long gun, yet it could be worked by three or four men, as against the fourteen of the 32-pr.'s crew. The heavy long gun necessarily remained the warship's chief offensive weapon, but with the British navy's addiction to close fighting the carronade was adopted in 1779, within a few months of being tested, for almost every class of ship, down to two-masted sloops and brigs—a rare instance of our making a prompt use of an invention.

For some odd administrative reason carronades were not included in our ships' gun-rating for many years, and the French, who were the first to feel the power of the new weapon, no doubt considered this concealment an instance of British perfidy. The carronade's most notable successes were, in its early days, due entirely to surprise, and in one case to a trick. An unexpected touch of imagination at the Admiralty sent to sea what would now be called a 'Q' ship. The *Glatton* was one of several big East Indiamen purchased for the navy in 1795; armed entirely with carronades, 68- and 32-prs., under a captain who was a carronade enthusiast, she sailed, in July 1796, to join Admiral Duncan, then blockading the Dutch fleet in the Texel. When off Goree she encountered a French squadron of four frigates and two corvettes. East Indiamen were then painted like warships, but the French, taking the *Glatton* for what she had been, a slow, unhandy merchantman, allowed her to come within hailing distance. She then ran up the White Ensign, and in a fight lasting only twenty minutes drove the squadron off in disorder, two of the frigates being in a shattered condition, their sides almost beaten in by the 68-pr. carronades. Men swarming in their rigging, ready to board, were swept away by grape from the upper deck 32-prs. The French losses were dreadful; the *Glatton* lost a marine officer killed, and a corporal wounded.

She was, however, the last ship above small unrated classes that we armed solely with the carronade. An obvious ship of war of any force could not hope to lure within range of this gun an enemy that did not wish to close. The carronade's true role was that of supernumerary to the normal main battery. Without her

proper complement of long guns, a ship faced perilous risks, as the Americans discovered at the very end of these wars. Every navy had adopted the carronade type of gun, but only that of the new United States shared the British relish for close fighting; and in the War of 1812 the disastrous error was made of replacing the main-deck guns of the frigate *Essex* with carronades. Caught in the neutral harbour of Valparaiso in 1814 by the 36-gun *Phoebe* and the sloop *Cherub*, which had the wind and kept their distance, the *Essex* was reduced to a helpless state by long-range fire to which she could make no reply.

3

Under the Establishment of 1719 economy had caused the costly gilding on the sterns of our ships to be still further reduced. About this time the rather ugly tar colour of the sides was replaced by a light brown, or, being left unpainted, when varnished they took on a deep cream appearance. A black streak showed above the waterline. The next change, in the second half of the century, also due to dockyard economies, was the colouring of the whole hull an unvarnished yellow or black, according to the captain's taste. The well-known pattern of broad longitudinal bands of black, separated along the gun-decks by bands of yellow (later white), on which the black port-lids produced a chequer-board appearance, was not universally adopted until the 1790s.

The Glorious Revolution had brought in stern galleries again, and the stripping of florid gilt ornament revealed the whole stern in its simple imitative form. Just as medieval plate armour reflected fashions in men's dress, so those parts of a ship's exterior which lent themselves to inventive design followed architectural styles on land. The stern of a two- or three-decker presented to the shipbuilder an immense flat area which he had to fill with such domestic features as windows and balconies, and in his composition of this façade he copied models with which he was familiar. In the tall, narrow seventeenth-century houses in Dutch and Belgian towns, with their characteristic Flemish gables, may be seen the sterns of the ships of Tromp and de Ruyter. Well on into the eighteenth century those of French men-of-war as

obviously derive from the rococo architecture of Louis XV. The English shipbuilder had in front of him homely buildings of the material in which he worked, and the double and triple galleries and pillars and glazing of the large posting inns were reproduced in the towering sterns of our wooden ships of the line.

Stern galleries at first projected beyond the flat face of the stern, but were later recessed, and then, for a time, completely glazed in. They were much beloved of admirals and captains, who by their means could get fresh air and a cramped form of exercise without appearing on the quarterdeck; and these officers protested so loudly at the loss of their private catwalks that soon after Trafalgar open galleries were restored. In any form, however, these huge square sterns, 'like Hardwick Hall more glass than wall', and of flimsy timbering, were the weakest feature of a big ship, and a raking fire into them could sweep gun-decks from end to end.

Square sterns were a survival from Tudor times, and the next weakest part of an eighteenth-century ship of the line, the forecastle, derived directly, even to its name, from the 'castles' of medieval craft—as in the French *gaillard d'avant*, *gaillard d'arrière*, which seems to hark back at least to Richard I's Chateau Gaillard at Les Andelys. A rectangular superstructure, in which was the galley, its square after bulkhead was crowned by the ship's bell, the crew's only means of knowing the time. Its forward bulkhead, from which the anchor cat-heads projected like horns, was partially protected by the beakhead and bowsprit, but its flat surface, like the flat stern, was very vulnerable to a raking fire. Yet it was made of such light timbering that grape-shot would penetrate it. By the second half of the eighteenth century this structural fault, common to the big ships of all navies, had been abandoned in the frigate class, probably because the square bulkhead caused a frigate's low bows to take in cascades of water in a head sea; her forecastle was accordingly carried forward in a curve to form a half-circle immediately abaft the bowsprit. Not until after Trafalgar was this improvement adopted in British two- and three-deckers, giving them rounded bows from the waterline to the forecastle rail. Rounded and more stoutly built sterns followed, provided with gun-ports.

Until towards the end of the eighteenth century, ships had their

upper gun-decks completely open in the waist. To connect forecastle and quarterdeck, light gangways were run along the bulwarks above the guns. These became wider, and rested on thwartship beams, at first removable, to carry boats and spars. By the beginning of the next century the space between the gangways had become a narrow opening in what in effect was another deck, the cluster of boats carried on the 'booms' admitting little light or air to the deck below. This feature was one of the novelties of the French *Pomone*; the vestigial remains of her waist extended only to the length of three gun-ports, and as on an otherwise flush deck she carried fourteen 8-prs. aft and four carronades forward, she was virtually a two-decked ship, for which type her class was sometimes mistaken. The big American frigates of the War of 1812 had flush spar decks. After the end of these wars, the logical course was adopted of closing the waist altogether on all British ships, giving them an extra continuous deck on which forecastle and quarterdeck became airy nothings, having only a local habitation and a name; but the after third of this deck, beyond an invisible line immediately abaft the main mast, was still dedicated ground, to be saluted by all officers, as it had been since some holy image, perhaps of the ship's patron saint, kept watch and ward in the stern.

4

If our ships were still faultily constructed at the end of the century, they were by then far more seaworthy and less unhealthy than they had been at the beginning. In the sort of practical details which every shipwright understood there was continuous improvement. Much was done to better internal conditions. More thorough caulking kept out damp, and sail rooms were provided where canvas would no longer rot. Ventilation remedied the injurious effects of gases from bilge water, though nothing could be done about the smell of livestock. A new type of stove mitigated the rigours of winter between decks, and the enlargement of gun-ports to two feet nine inches square let in more air in summer. Economy—ochre being cheap—brightened gun-decks, which were painted yellow instead of the dark and sinister red. The outstanding cause of ill-health at sea lay beyond the range of dockyard

reforms, but the last quarter of the century also saw the beginning of the end of the appalling ravages of scurvy. By 1812 British seamen were already nicknamed by their new American opponents 'lime juicers' or 'limeys'. In 1813, it is worth noting, the sailor's staple diet of maggoty biscuit and 'salt horse' was varied by the invention of an enterprising firm of London caterers, which supplied the navy with its first tins of preserved meat. Labelled *Bœuf Bouilli*, in the idiom of the lower deck this delicacy became Bully Beef.*

Though the new century had come before trussed frames and diagonals between the keel and the lower gun-deck reduced the danger in big British ships of arching or hogging, long before this seaworthiness in general was improved by new processes for rendering timber supple and less prone to decay. Decay, however, aggravated by dockyard neglect and the use of inferior oak, continued in some cases to be shockingly rapid; at the very end of this period, three 74s built of imported oak between 1808 and 1812 were so decayed within five years that they were sold out of the service. Ships began to rot before they were launched because they were left uncovered on the slips, sometimes for years. Slips had long been housed abroad, but it was not until the 1790s that we began to put roofs over them, and to give hulls a light covering after launching. Before such obvious precautions could be taken, much prejudice in the shipyards had to be overcome.

The oldest and worst cause of decay, imperfect methods of sheathing, had, however, by then been conquered. In 1761 the new 32-gun frigate *Alarm* was experimentally sheathed with copper. The iron bolts with which at first the copper was nailed to the ship's bottom became corroded by oxidization, and bolts of mixed metal proved scarcely more satisfactory; copper bolts were then substituted, with such successful results that in 1783 copper sheathing was ordered to be used throughout the navy. Now, at last, barnacles and weeds and sea worms had met their match—not only were timbers protected against them, but copper is an unsympathetic material to cling to, and cleaner bottoms made faster ships. The process was expensive, the cost of coppering a first rate being about £2,270, and there were the usual moans on the ground of economy, but they were countered in the best

* Reginald Hargreaves, 'The Battle Winner', R.U.S.I. Journal, Nov. 1952.

possible way by Rodney's victory over the Spanish admiral, Langara, in January 1780. It was his copper-bottomed ships, outsailing the rest in a gale, that overhauled the enemy and brought him to action.

By this date a full-rigged ship had acquired almost her full set of sails. Warfare was responsible for the development, for merchantmen were not yet built for speed, and though they copied naval rig they had little hope of showing their heels to fighting ships. To the first triangular head-sails another jib was added, spread on a jib-boom projecting from the bowsprit, and later came a flying jib on a flying jib-boom. There being no room among the jibs for the spritsail topsail, this was set in front of the spritsail, beneath the bowsprit. These sails disappeared early in the next century. With the introduction of jibs, the foremast, which had been stepped right in the bows, was moved some feet further aft. More than a century earlier, the *Sovereign of the Seas* is shown with a topgallant sail on her mizzen and 'top-topgallants' or 'royalls' above her fore and main topgallant sails, but in these respects, if the drawing is correct, she was then unique, and she remained so until 1770 or later, when a mizzen topgallant sail became standard, to be followed, before 1790, by the final set of square sails, the royals, for use in light winds. They completed the pyramid of canvas of the wooden warship. Until the coming of the big clippers there was no more noble sight at sea than a ship of the line of 1800 under full sail, nor one more impressive than a whole fleet, royals and studding-sails set, bearing down for battle, as the two columns of the British fleet bore down upon the enemy at Trafalgar.

With the growing spread of canvas, pine trees which in Milton's day may have been tall and stout enough 'to be the mast of some great ammiral', even taking this term to mean no more than the lower mast, were increasingly hard to come by; and before that date a big ship's lower masts were composite, built up of curved outer segments dovetailed to a square core, the whole being bound round at intervals by rope-wooldings, later replaced by iron hoops. Lower masts, stepped above the keel and rising through several decks, were subjected to great strains by the working of a ship as she rolled, and it was found that the composite type took these strains better than single spars of equal

size. The lower masts of a ship of the line were very massive; that of the mainmast of a 74 of the largest class at the end of the eighteenth century was above a hundred feet long and might be four and a half feet in diameter.

The history of the British navy in that century may fairly be divided into two periods, before and after Anson, so much did it owe to his influence and his practical reforms and innovations. Standing rigging, the shrouds and stays that supported a ship's masts, was fully developed in the early days of three- and four-masters; but ships of the line built after Anson was at the Admiralty may be distinguished from those built earlier by the position of the fore and main chains or channels, the stout platforms projecting from the vessel's sides (and hence sometimes called chain-wales), which extended and tautened the shrouds of the lower masts. These main chains for the fore and main masts were at the level of the upper gun-deck, where they got severely buffeted and strained in a sea, until Anson's experience in the *Centurion*, in the so-called Pacific Ocean, caused him to raise them to the height of her mizzen channels, at quarterdeck level, a feature which henceforward became standard in our two- and three-deckers.

CHAPTER ELEVEN

Logistics and Tactics

1

As an instrument of warfare the wooden sailing ship had certain advantages over the steam vessels of iron and steel that were to supersede her. Since her long reign virtually coincided with that of the 32- or 36-pr. muzzle-loader as the heaviest naval gun in common use, quite serious battle damage could often be repaired at sea, whereas some minor injury to an iron or steel ship by the more powerful weapons of the future might require immediate dockyard attention, and any major hurt certainly would. Dependence upon steam power, again, meant frequent returns to port to refuel, while a ship relying upon wind propulsion could remain at sea for very long periods, provided she was in good condition and able to renew essential supplies with reasonable frequency.

Huge mechanized armies have made us familiar with the term logistics. Applied to naval strategy, in the case of eighteenth-century fleets the problem was greatly complicated by weather. An army can march from one point to another in the teeth of a gale, but adverse winds could ruin the best-laid naval plan. On the other hand, a fleet was not normally beset by worries about the second branch of logistics, supply, because whether in home or distant waters it operated from local bases, and apart from occasional transatlantic voyages it was seldom cruising for long.

Much-publicized exceptions to this rule, being a part of the Nelson epic, are the close blockades before Trafalgar. Everyone knows that Nelson himself was tossing for two years in the Gulf of Lions and the Atlantic without setting foot on land. But methods for keeping a fleet at sea for months on end were not inventions of his day—they had been evolved and applied for the same reason, to maintain a blockade, forty years earlier. The reputation of Hawke as a great fighting admiral was established by the sequel, the Battle of Quiberon Bay; but what he accomplished during the preceding seven months is as remarkable. His blockade

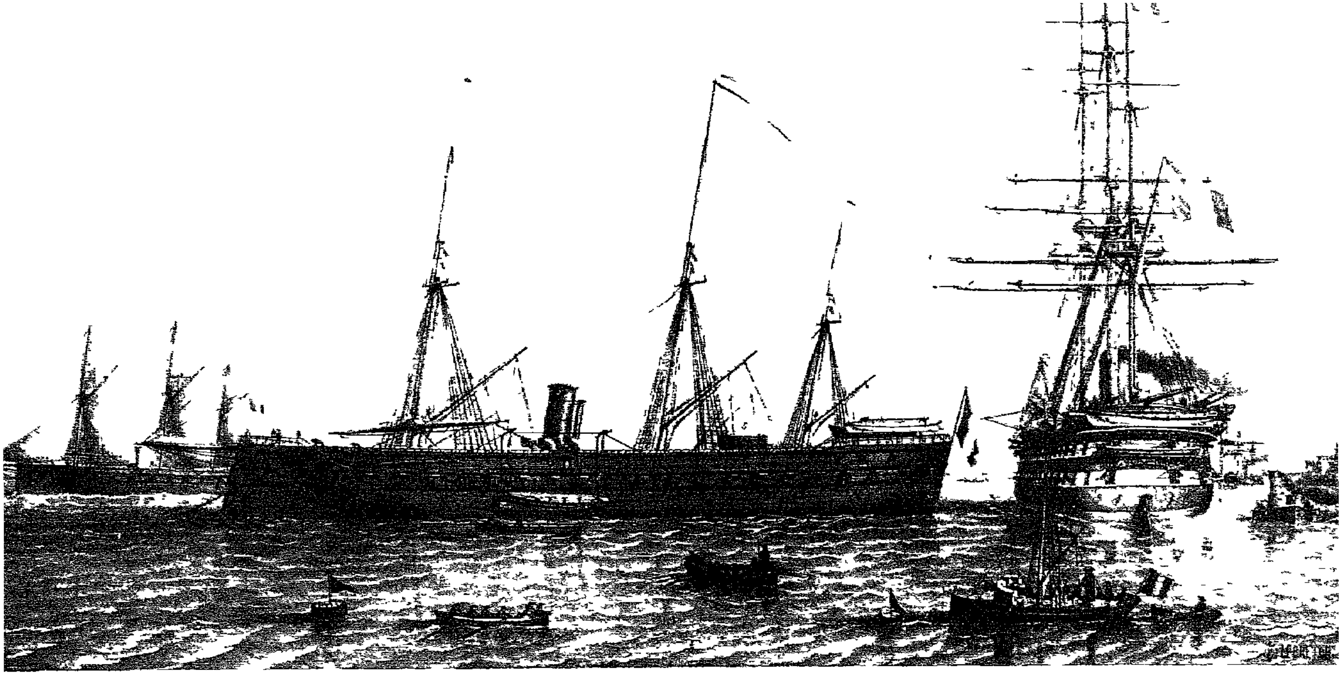
of Conflans's fleet at Brest, to quote a recent writer, 'may be said to have initiated a revolution in naval strategy'.*

Plans for the invasion of these islands, *malgré* the Royal Navy, have always fascinated Continental statesmen and generals, who seldom come near to appreciating the all but insuperable difficulties of the task. The long series of eighteenth-century wars with France began and ended with visionary invasion schemes. Among others, midway in the period, in 1759, an earlier project was revived by the French minister Choiseul in an attempt to counter the coming British attack on Canada. No one could call it unadventurous; the Brest and Toulon squadrons, having combined to escort 20,000 troops from Britanny to the Clyde and covered their disembarkation, were to carry on north about round Scotland and down the North Sea, to sweep opposition aside while another 50,000 men crossed from Flanders to Essex. Most of the British army being overseas, in America and Germany, the threat had to be taken seriously, and a strong Channel Squadron under Hawke was built up to keep watch over Conflans's fleet at Brest. The smaller Toulon squadron was the responsibility of Boscawen.

Such an operation as the close blockade of a port had never been attempted. Even Anson, then First Lord, did not consider it could be done; and when Hawke hoisted his flag that May his instructions followed traditional lines—while light craft watched Brest, the battle fleet would lie at Plymouth or Torbay. Hawke however, having taken eighteen sail of the line to look into Brest, where he found eleven big ships, apparently ready for sea, in the outer road, did not think it prudent, as he notified the Admiralty, 'to leave them at liberty to come out, by returning to Torbay'. He proposed to take station with his whole fleet, weather permitting, a few leagues off the island we call Ushant, in the open Atlantic and due west of the port.

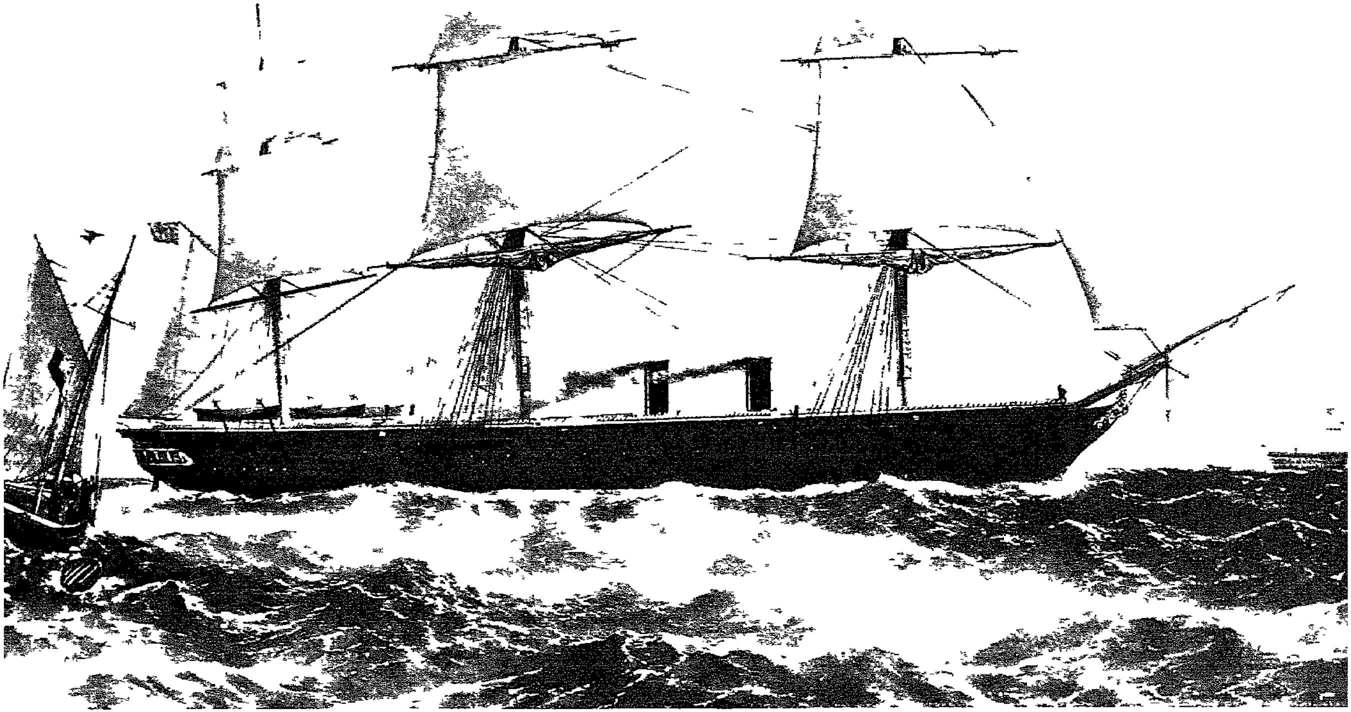
Though Hawke cannot have foreseen that he would have to keep up this blockade for seven months, his decision meant that a system of supply and maintenance must at once be put in hand. It was an entirely novel feat of organization. As practice brought it somewhere near perfection, in fair weather a stream of victuallers came regularly from the western ports to where the fleet beat to

* G. J. Marcus, 'Hawke's Blockade of Brest', R.U.S.I. Journal, Nov. 1959.



The *Gloire*, 1859 Originally a two-decker of the type shown astern of her. In the middle distance is one of the *Gloire*'s sister ships under sail

From a coloured lithograph by Le Breton



H M S *Warrior*, 1860

From a coloured aquatint by T G Dutton

and fro off Ushant. They brought butter and cheese, beef and pork, bullocks and sheep for the sick, fresh vegetables and beer. Hawke had had experience of the ravages of sickness caused on crowded ships by the bad food too often provided, and one of his chief cares was the health of his men. A board of officers took a high hand with dockyard bureaucrats and swindling contractors, condemning and sending back whole cargoes of maggoty bread and beer unfit to drink. Never before, it was said, had a fleet been so well supplied.

Though eventually Hawke had thirty-two sail of the line, he could seldom muster more than twenty-four together on the station. Conflans had twenty-two of the line at Brest. There were always several ships of the blockading fleet cleaning and refitting at Plymouth—work which Hawke laid it down must be done by dockyard hands, while the crews rested. A ten days' break was the most he could allow. As the blockade dragged on through the summer into autumn, and the weather worsened, ships and men began to show the effects of the strain. Two of the inshore squadron, which patrolled close to the savage coast and reported every movement of the French fleet, leaked so badly that they were sent home as unseaworthy. In the last six weeks of the blockade eleven of the line were undergoing repairs; and Hawke was to fight his battle with twenty-three to Conflans's twenty-one.

The blockade was conditioned by the Atlantic's prevalent westerly winds. A gale which might force Hawke to run for shelter at Plymouth or Torbay, blew dead into the narrow entrance of the Rade de Brest, bottling up the fleet there. There was a risk that when the storm moderated Conflans might slip out before the blockading fleet could return to its station off Ushant; and this was what happened when the equinoctial gales set in, and in November drove Hawke up the Channel, at the same time aiding a small squadron from the West Indies to slip into Brest.

Boscawen had long since disposed of the Toulon squadron, and with it of the English part of the invasion plan. When Conflans got his fleet out on 14 November he made for Quiberon Bay, where lay most of the transports for the Clyde expeditionary force, the troops being in and about Vannes, at the head of the bay. Choiseul still hoped to invade Scotland. Conflans was obeying orders, but he had no illusions; his fleet was short of

stores, and his crews, after lying so long in port, were in no condition to keep the sea in winter, still less to meet the hardened blockaders in battle. It was their admiral's aim to avoid one; but on the threshold of his new refuge it overtook him. Hawke had outsailed him, and in the wild seas of a north-westerly gale the Brest fleet was chased right into Quiberon Bay, where its ships not sunk or captured were run aground. For the time being it was eliminated.

2

There was no room in Quiberon Bay for tactics. The victory was won by the admiral's daring and by the superb seamanship of his captains. For the fine flower of British naval tactics of the period, as nourished on Fighting Instructions, we have to go back to Byng's action off Minorca in 1756 and to that of Mathews with a Franco-Spanish fleet twelve years earlier. These engagements show the grotesque results of a strict interpretation of the Instructions.

Mathews was on bad terms with his second-in-command, Lestock, commanding the rear division. Though the signal was made for the line of battle, the line was never formed; ships straggled, and the rear was several miles astern of the centre and van. As Lestock, though to windward, failed to close the gap, Mathews hoisted the signal to engage while that for the line was still flying, and bore down in his flagship to attack the Spanish admiral. Only a few ships supported him. When the scrambling action ended, one prize had been taken—by Captain Hawke.

In England this miserable affair caused an uproar and a record batch of courts martial. Two admirals and eleven captains were charged with varying degrees of misconduct. Some of the courts' findings seem incredible today. Mathews, who had laid his ship alongside an enemy's, and three captains who had fought the whole French van, were cashiered because they broke the line; yet eight more captains were found guilty of not doing their best to engage. Lestock, whose conduct was disgraceful, was acquitted, his defence being that he could not obey the signal to engage without breaking the line, the signal for which was still flying. Probably Hawke would have suffered for defying the Instructions

if his prize had not made him popular with the public and the king. Politics played a dirty part in the shocking miscarriage of justice as between Mathews and Lestock.

These proceedings held a warning for self-seeking or irresolute officers. Among those who took it to heart was Captain John Byng. Twelve years later, when we were again at war with France, he was an admiral, and, in April 1756, was on his way to take up the Mediterranean command. The French had already sprung a surprise; under cover of one of the century's many invasion threats, which distracted the British government's attention, the Toulon squadron put to sea with a fleet of transports and landed 15,000 men on Minorca. Port Mahon, then our main naval base in the Mediterranean, was invested. The garrison was very weak, and all the senior officers were absent on leave. The only naval force on the station, until Byng arrived, was a few ships at Gibraltar.

Altogether he should have had thirteen sail of the line, but actually had twelve, when he came in sight of Minorca six weeks later, on 19 May. Port Mahon could not resist much longer. Blockading the port, the French admiral, Galissonière, also had twelve of the line, but his squadron was the more powerful of the two. He stood out to intercept Byng, keeping between the latter and the harbour, and, as the French preferred, in the leeward position, the wind being east.

Both fleets were heading south, and it was Byng's intention to fight a tidy parallel battle, the ships engaging in pairs. But his line came down at an angle to that of the French, so that when he made the signal to engage his leading ships were closing the enemy while those in the rear were still almost out of range. The van was much damaged aloft, and the sixth ship in the line losing her fore topmast and coming aback, she threw those astern of her into confusion. Byng's flagship, the *Ramillies*, got out of her order in the line, and Byng himself was paralysed by recollections of what had happened to Mathews. 'You would not have me, as admiral of the fleet,' he said to his flag captain, 'run down as if I were going to engage a single ship. It was Mr. Mathews's misfortune to be prejudiced by not carrying down his force together, which I shall endeavour to avoid.' While the rear was being got into the order which Byng prized so greatly it was

never within effective range of the enemy, and by the time it was ready to bear down and close, the van, having fought the whole French fleet, was too shattered to do more. Galissonière, true to the doctrine of the ulterior objective, did not press his advantage, and the fleets separated during the night. Byng spent four days refitting the battered ships of the van, and a council of war then decided to abandon Port Mahon to its fate. It surrendered soon afterwards.

The findings of the court martial which condemned Admiral Byng shared the inconsistencies common to so many of these proceedings when the baleful influence of Fighting Instructions was at its height. Byng had lost his battle because he obeyed the Instructions, refusing to break his line and wasting time restoring order; nevertheless, he was found guilty of not doing his utmost to defeat the enemy or to come to the aid of Port Mahon; and for this offence, under a new clause in the 12th Article of War, there was only one penalty, death. The government, which had neglected the Mediterranean, needed a scapegoat, and the king was implacable. What really killed Byng, however, as they had ruined Mathews, were the Fighting Instructions.

3

Neither Anson nor Hawke ever fought a set-piece battle, their victories being gained in the conditions of a general chase; but from their conduct of these it may be taken for granted that in a more formal type of engagement they would not have hesitated to put a tactical opportunity before Fighting Instructions. More fortunate than Mathews, they would have been supported by their subordinates, and unorthodoxy would no doubt have been justified by success. It is often an unfair outcome of rigid rules that disobedience to them is punished only when it fails.

When Rodney demolished the sanctity of the line by breaking both his own and that of the enemy at the Battle of the Saints in 1782, it caused a great stir, so tyrannized were British naval officers by the Instructions even at that date. In the same year, as it happened, Nelson's principle of concentration on a part of the hostile fleet was anticipated in the Indian Ocean by Suffren, the hardest hitter and one of the ablest tacticians the French

navy has produced. Nelson, who later studied under Hood the method of attack by doubling, may have learnt of Suffren's tactics. As for the Instructions, he was soon to show how an exceptional man could ignore every one of them.

He was exceptional, and he was young, as admirals went then; among older British flag officers, some of whom were to command fleets against those of the French Republic and Empire, a deadening influence lived on. Past bad habits had a share in it, but the dazzle of triumphs to come has tended to obscure the fact that the Royal Navy entered the Napoleonic wars under a cloud. The culmination of a period of adversity had been the abandonment, after a mismanaged action, of Cornwallis's army at Yorktown, and with it of the last hope of the retention of our American colonies. In spite of the Battle of the Saints a few months later, the country's faith in the navy remained a little shaken; and the disastrous effect upon that of France of egalitarian notions being unrealized, popular relief dubbed Howe's limited success on 1 June 1794 with the unsuitable epithet 'glorious'.

The capture of six sail of the line out of twenty-five or thirty was, however, well up to the standards of the time. Even as late as 1805, when Calder with fifteen ships took two of the Combined Fleet's twenty, he thought he had done well. He was soon to be undeceived; Nelson had altered all that. At Quiberon Bay Hawke had been given a chance to destroy the Brest fleet, and he seized it; but Nelson raised destruction to a principle, a normal aim in battle. When his turn to meet the Combined Fleet came at Trafalgar, where the proportionate strengths were much the same as in Calder's action, he expected twenty prizes.

His famous 'touch' had its most revolutionary effect, which did not outlive him, on Fighting Instructions. These have always laid it down as axiomatic that a fleet commander should endeavour to keep control of his whole fleet in battle. When the Admiralty revived Instructions in 1918, conditions were much more favourable to the enforcement of the rule than they had been in the days of sail. The rigidity of its terms, however, and of those defining a fleet's tactical deployment, were unchanged when the Second World War came. They were then quite out of date; and it is thought that too strict obedience to them may account for

Admiral Holland's handling of his two big ships when they met the *Bismarck*—an unhappy echo, if true, of the eighteenth century.* It does not appear that Nelson ever paid much regard to the Instructions of his day, except to point out, as in his Trafalgar Memorandum, some of the fallacies they had perpetuated; and in his first battle he threw axiom after axiom overboard.

4

The Battle of the Nile was in two respects something quite new in eighteenth-century naval warfare. In a formal action between fleets of fairly equal strength, it was Nelson's intention from the first to destroy the enemy, not just to take a few prizes; and having again and again during the weeks of searching the eastern Mediterranean discussed with his captains plans to meet every likely contingency in the expected battle, in the form it took he left it very largely to them to conduct it. Night falls early along the north coast of Africa, and it was three in the afternoon before the French fleet was sighted and after sunset when the action began; and no ordinary commander of the time, to profit by the remaining half-hour of daylight, would have dreamt of sending his ships in pell-mell, in the ragged order of sailing, to fight in the dark. The half-hour would have been spent in forming line, and the battle put off until next morning, if the enemy conveniently waited. But then no ordinary commander would have taken mere captains into his confidence, still less trained them to think and act for themselves in an emergency. Such delegation of responsibility ran counter to all professional teaching, and was indeed expressly forbidden by Fighting Instructions—as it was to be again in the new series introduced in 1918, in which the hand of Admiral Jellicoe is plainly apparent.

In transporting the Army of the Orient from Toulon to Alexandria in the summer of 1798, in face of a British fleet, Bonaparte was taking appalling risks, of which he seems to have been quite unaware. His career would almost certainly have ended *en route* had Nelson's frigates not gone astray. The risks must have haunted Admiral Brueys, and the safe arrival of the two hundred

* S. W. Roskill, *The Navy at War, 1939–45* (Collins, 1960).

transports at Alexandria have seemed almost miraculous. Anxious to get his squadron off the coast, he was ordered by Bonaparte to remain to support the army; and the port being in no state to take battleships, he anchored his thirteen of the line and four frigates in the neighbouring bay of Aboukir. His flagship, the *Orient*, was a three-decker of 120 guns, and he had three 80-gun ships and nine 74s.

This was in July, and it was on the afternoon of 1 August that the British topsails came over the western horizon. Brueys had already decided to fight at anchor. The wind was NNW. but light, and it was just on five o'clock before Nelson got a clear view of the French line and signalled, 'Attack enemy's van and centre.' He made only two more signals—at five-thirty, for the fleet to form line ahead and astern of his flagship, the *Vanguard*, and ten minutes later for close action. As he had thirteen 74s and one 50-gun ship, the French (excluding the frigates) had a slight advantage in weight of metal.

In ordering his fleet to form line, Nelson did not mean what the Fighting Instructions meant by that term, as his captains well understood. His ships were much scattered, four being five or six miles behind the main body, and it was in two groups, ahead and astern of the *Vanguard*, that this turned into the north curve of the bay, the better sailers taking the lead as if the signal had been for a general chase. Thus Captain Foley's *Goliath*, by outsailing the *Zealous*, was the first to get into action. It happened that only Foley possessed a fairly reliable chart of the bay, whose shallows were known to require careful navigation, and he saw at once that the faulty disposition of the French fleet laid it open to the crushing process of doubling.

The possibility of this does not seem to have entered the mind of any French officer. It was taken for granted that the attack would be delivered against the seaward side of the anchored line; and Brueys appears to have been so confident of beating it off that he neglected obvious precautions. When moored British fleets repulsed similar attacks in the West Indies their line was well closed up, but the intervals between the French ships in Aboukir Bay were far too wide. The line should have been nearer to the shallows along the shore, where the frigates were anchored. At the north end of the bay a shoal extended southward from the

island of Bekier, and the 74-gun *Guerrier*, at single anchor at the head of the line, should have moored close to the shoal, in five fathoms. Far from doing so, she left a deep-water channel under her bows, a fault Brueys did not trouble to correct. So little were the dangers from British seamanship appreciated that his inshore or port batteries were not ready for action, the gun-crews on some ships having to clear away casks and other stores before they could run the guns out.

It seems pointless to argue about who should be given most credit, Foley or Nelson, for the former's decision to lead round the head of the French line. Doubling a part of a fleet at anchor had been among the plans Nelson had discussed with all his captains, and in his absence at the start of an action he relied on their judgement. Any seaman would know that if the *Guerrier* could swing at her mooring there was room for another ship inshore of her; and Foley, watching his chart and sounding constantly, having received her fire passed almost under her bowsprit, raking her as he went by. Before he could anchor on her inner bow, as he intended, the *Goliath* had drifted abreast of the *Conquérant*, second in the French line, and the *Zealous*, following close astern, took her position on the *Guerrier*'s bow.

As the process continued, darkness fell. The five leading ships having passed inshore of the *Guerrier*, leaving her a mastless wreck, Nelson's *Vanguard* and four more anchored on the outer side of the French line, reaching down to the ninth ship, the second astern of Brueys's huge flagship. Nelson was now in a position to resume control of his fleet, which followed the *Vanguard* in hoisting distinguishing lights. Three 74s and the little *Leander* were still out of the fight; by grounding on the Bekier shoal the captain of the *Culloden* nearly broke his heart, but his consorts, thus warned, in a masterly manner took station in the darkness in gaps ahead of the *Vanguard*. The *Swiftsure* came just in time to replace the *Bellerophon*, which was crushed by the heavy broadsides of the *Orient*, and was now, her masts gone, her cables cut, a third of her crew dead or wounded, drifting out into the bay. The *Leander*, having failed to tow the *Culloden* off the shoal, anchored neatly athwart the hawse of the *Franklin*, raking that ship and her next ahead with her 24- and 12-prs.

Two hours after the first shots were fired the first five ships in

the French line, hammered from both sides, were prizes or silent dismasted hulks. Brueys was dead of wounds when the *Orient*, seventh in the line, was seen to be on fire. Freshly painted, with paint and oil still lying about, the great three-decker was soon blazing, lighting the battle and the whole bay with her flames. Within an hour, at ten o'clock, she blew up, a rain of burning fragments falling on both fleets. There is no truth in the legend that £600,000 looted from Malta went down with her, but like that of the Armada's wrecked treasure, it lives on.

The tremendous explosion silenced the guns, and the blackness seemed deeper than before when firing was renewed. For several hours the British worked down what was left of the French line, until exhaustion and the need to repair damage temporarily brought about a pause in the action. It was thought in the fleet that if Nelson had not been suffering from the effects of a slight wound in the head the victory would have been completed then and there in the spirit of his own saying—'If we had taken ten ships out of the enemy's eleven, and let the eleventh escape, being able to take her, I could never call such a good day.' As it was, the four rearmost French ships were left to be dealt with in daylight.

These were two 80s and two 74s, Brueys having made another mistake in stationing his most powerful ships in the rear half of his line. At dawn one of the 80s surrendered, and the 74-gun *Timoléon* was destroyed by her crew; but the other pair, the flagship *Guillaume Tell* and *Généreux*, and two 40-gun frigates, cut their cables and got away. Of two 36-gun frigates, one had been sunk by a retaliatory broadside from the *Orion*, and the captain of the other set her on fire. Only the *Zealous* was in a condition to pursue the four fugitives, but having made sail she was recalled. Though the night's fighting had been at close, sometimes very close, range, the French gunners seem as usual to have elevated their pieces, for the other British ships were much cut about aloft, while casualties, except on the *Bellerophon* and *Majestic*, were not in the circumstances very heavy, averaging between forty and fifty per ship. The French losses were dreadful—some four thousand died out of eight thousand on the ships taken or sunk.

The triumph was not rounded off completely on the spot, but it was thorough and startling enough. There had not been one

like it since Henry VIII put big guns on his ships. At the end of a century of naval battles almost all of which had been fought according to cramping rules, and of commanders far too easily satisfied, here was an annihilating victory won by tactics that ignored every rule, and a commander to whom, in the modern phrase, the sky was the limit. It made a tidy finish that both the *Guillaume Tell* and the *Généreux* were soon taken (at the cost of the little *Leander*); but when they escaped from Aboukir Bay Brueys's fleet already ceased to exist. Of the remaining eleven sail of the line, nine were prizes and two had been destroyed. This battle of elimination made a profound impression on the world, and it gave a shock to the unstable morale of the new and still raw French navy from which this never recovered. Brueys's fears during the passage from Toulon to Alexandria were chiefly of the British getting among his huge fleet of transports, packed with troops, and having shed this anxiety he and his men seem to have awaited attack at their anchorage with confidence. At Trafalgar, Villeneuve, the fugitive from Aboukir, and his captains and crews expected to be beaten.

5

During the generation after Trafalgar the prestige of the Royal Navy was at its height. It was very conscious of its material and moral supremacy, and of its influence in world affairs. There being as yet no electric telegraph, British naval officers in distant seas were accustomed to assume wide responsibilities.

On 20 October 1827, a fleet of twenty-six British, French and Russian ships, ten being of the line, commanded by a British admiral, sailed into the Bay of Navarino, on the coast of the Morea, where a mixed Turkish and Egyptian fleet lay at anchor. Greece was then a Turkish dependency, and a popular insurrection was being crushed with fearful barbarity by savage irregulars under the Egyptian Ibrahim Pasha. The three allied powers had combined to put a stop to these atrocities, but without any clear idea of how to set about it. They had no authority to interfere in the internal affairs of the Ottoman Empire. The British cabinet had enjoined the commander on the spot, Admiral Sir Edward Codrington, to act with great caution, but Paris and St. Petersburg

held more realistic views, and felt fewer scruples, and this attitude the admiral fully shared.

In no mood to stand any nonsense from a pack of blood-thirsty orientals, to a protest from the Turkish admiral, Codrington replied that he had come to give orders, not to receive them, and that if a shot was fired at the allied fleet the Turkish fleet would be destroyed. Inevitably, in such circumstances, a few musket shots were fired; and without further parley the systematic destruction of the Turkish fleet began. Three ships of the line, a dozen frigates or large sloops, and some forty smaller craft were sunk or burnt, with fearful loss of life. A story that the French, who had not forgotten the Retreat from Moscow, took advantage of the smoke to fire at Russian ships, which naturally retaliated, throws a quaint light on the triple alliance.

It is only fair to say that this unauthorized and inglorious intervention gave the first impulse to the achievement of Greek freedom which owes more to a British admiral than to British poets and politicians. For another reason Navarino is a noteworthy event—it was virtually the swansong of the old Royal Navy. Codrington was responsible for an act of great provocation, and for the slaughter that followed, not merely because he was in command, but also because he had behind him the immense prestige of British sea power. He took this for granted, and so did his French and Russian colleagues. The armies of various European powers had in turn dominated the Continent; at sea, all over the globe, the British navy was for long, ruler, law-giver and policeman. Its rule was still unquestioned in 1827.

But this happy state of affairs was then rapidly drawing to an end. British naval supremacy at the time of Navarino was still founded on an unrivalled experience in handling sailing ships armed with weapons that had improved little since the first guns were cast. To Admiral Codrington, as to Nelson and Hawke, to Blake and Howard, seamanship meant a high degree of skill in making the most of winds and currents. The recipe for success in battle was still that of Richard Hawkins—'The nearer the better.' Navarino was the last big fleet action fought under sail, and the last in which smooth-bore guns were exclusively used.

The British navy was not to fight another battle for eighty-seven years. In the meantime it was to be compelled, like other

navies, but at first more reluctantly, to go back to school—and to stay there. The curriculum was unlike anything it had ever known; instead of a process as imperceptible as the growth of the oak trees that went to make its ships, novelty crowded upon novelty; and new skills had to be learned, new traditions built up, lost ascendancy regained, under ceaseless pressure from the technical advances that fill the three generations between Navarino and Jutland.

PART THREE

THE AGE OF THE ENGINEER

CHAPTER TWELVE

Steam, Iron and Shells

1

NINE years after Navarino, in 1836, a young Swedish engineer, who had anglicized his name as John Ericsson, was endeavouring to interest the Admiralty in a screw propeller which he had patented. It is not for this that Ericsson deserves a brief biographical note, but for another invention that he was already turning over in his mind. Twenty-six years later his armoured gun-turret was in every sense to revolutionize naval architecture, which thenceforward was to be dominated by the principle of the revolving platform for a ship's ordnance.

A captain in the engineering branch of the Swedish army when he was little more than twenty, Ericsson resigned from that service to seek his fortune in England, where land transport was about to be transformed by the railway. He designed a locomotive, the 'Novelty', which he entered for the famous competition at Rainhill in 1829. Stephenson's 'Rocket' won the prize, the 'Novelty', which was thought to be the faster, blowing a tube. During the next few years, when Ericsson was often in great straits for want of money, he turned his inventive genius from railways to ships. In particular, he had warships, and the British navy, in mind.

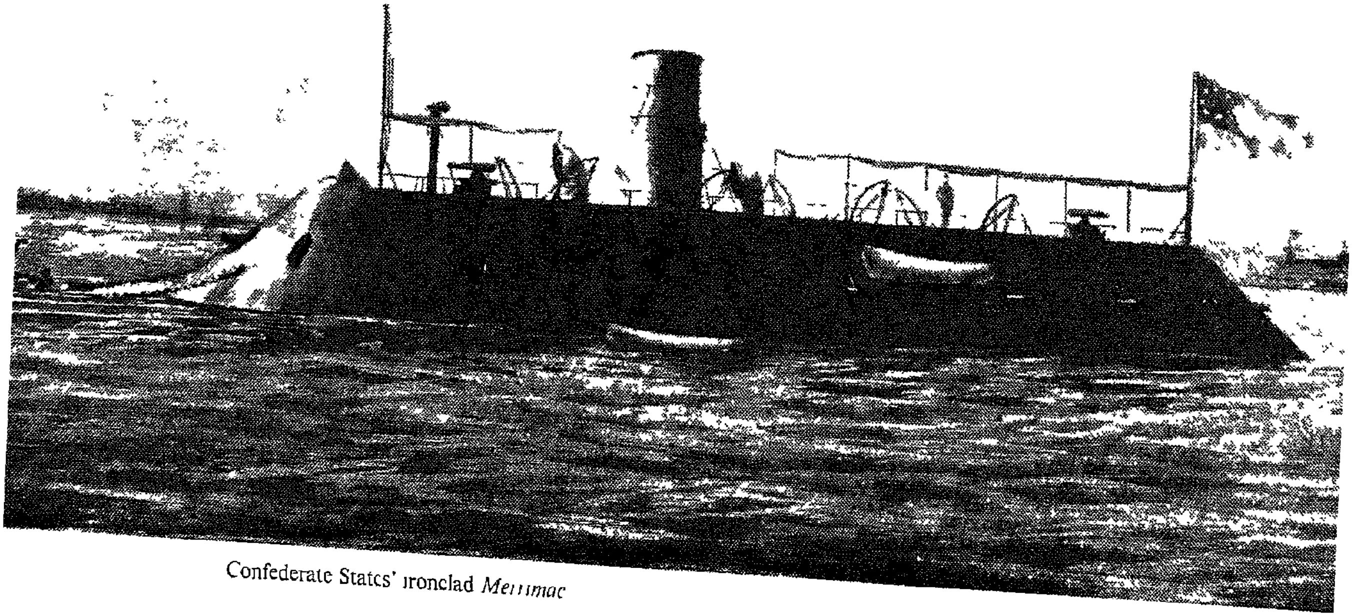
The application of steam power to ships was then being rapidly developed for commercial purposes. For fighting ships, however, the new power was almost worthless, because of the method of propulsion employed—the paddle-wheel. The big paddles could be smashed by a single shot, and their vertical machinery, being above the waterline, was equally vulnerable. The clumsy engines took up so much room, and the paddle-boxes covered so much of a ship's side, that only a few guns could be mounted forward and aft. The first little paddle-steamers built for the Royal Navy, in 1822, were intended for use as tugs, and were unarmed. The later mail packets, of bigger tonnage, were given some small guns. All

were wooden vessels, and rigged for sail. Iron ships had been built, and in this year, 1836, John Laird, the Birkenhead shipbuilder, proposed to design an iron warship, but the Admiralty was not interested. Six years afterwards the first iron warships were indeed to be built in the Thames—for the Mexican navy.

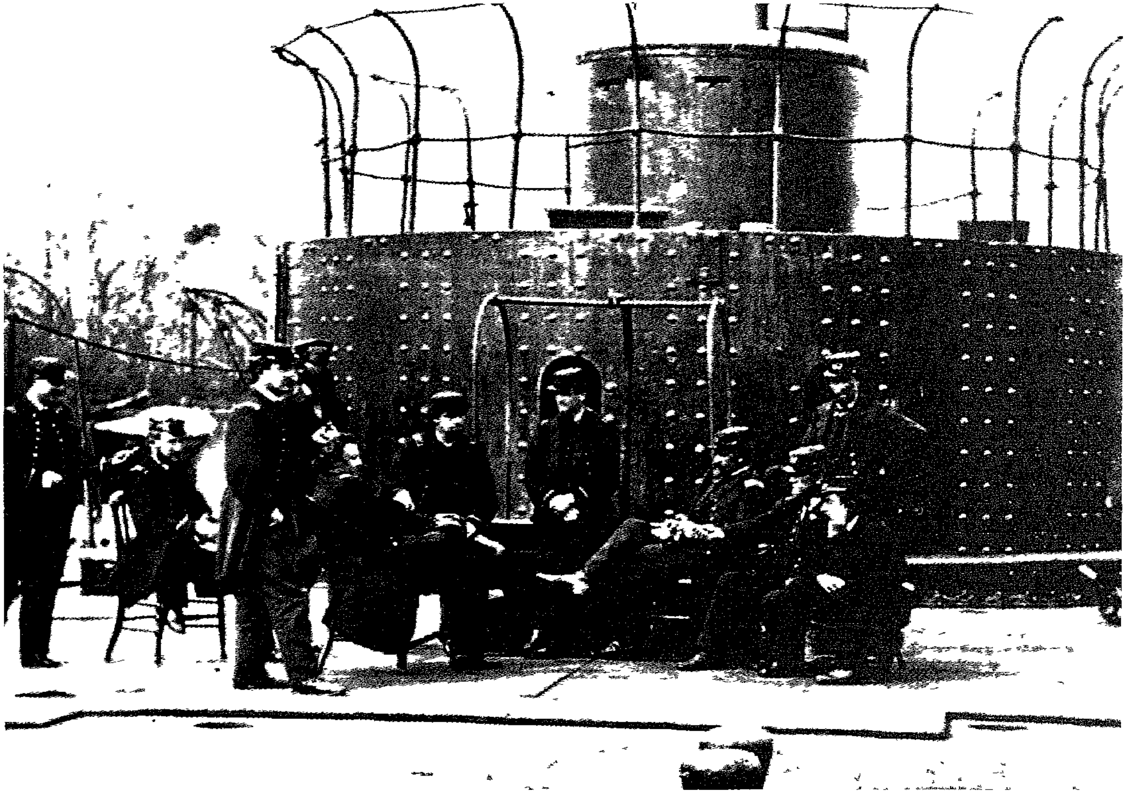
Nor was the Admiralty at first impressed by the possibilities and obvious advantages of the screw propeller. The principle, the power of a helical blade in water, had been known since Archimedes of Syracuse, or some even earlier mathematician, designed the screw-pump. In 1752 a Frenchman, Bernoulli, advocated the use of a screw propeller, to be turned by horses or men on board the ship, or by what he termed, without going into tiresome details, a *pompe à feu*. Joseph Bramah, better known for his water-closet, had patented a screw for driving vessels through the water in 1785, and Bushnell and Fulton in America had proved that the method worked. Bernoulli's *pompe à feu*, or its equivalent, the steam engine, having arrived, by the 1830s there was a revival of interest in the screw propeller. In England several more designs had been patented before John Ericsson's. For fighting ships, the screw had every merit; operating below the waterline, it enabled a ship's engines to be placed deep in the hold, out of harm's way, and her battery had the uninterrupted use of her sides.

Having built a steam launch, forty feet long, equipped with twin propellers, Ericsson towed Admiralty officials in a barge up the Thames at what was then the high speed of ten knots. Though he took it under one of the arches of the new Waterloo Bridge, the barge may have affected the launch's steering; its passengers, at any rate, reported that a vessel propelled at the stern must be unsteerable. Eminent engineers joined in condemning the principle of the screw, and there was naturally opposition from vested interests—the manufacturers of paddle-wheels, who did not want to have to scrap their machinery. It is clear that the Board of Admiralty welcomed the adverse report. Ericsson's ill-luck still pursued him.

It was now, however, about to turn, and a younger and then more enterprising service was to benefit by his genius. There was in London at that time a scientific and influential officer of the United States Navy, Captain R. F. Stockton. On his instructions a



Confederate States' ironclad *Merrimac*



U.S.S. *Monitor*, with pilot house on top of the turret as in all later ships of this class

small iron steamer was built and fitted with Ericsson's screw. Completed in 1840, it crossed the Atlantic. Ericsson followed; and in 1843 the U.S.S. *Princeton* was launched, the first screw warship. A large 10-gun sloop, she had a six-bladed screw of Ericsson's pattern and engines of about 400 horse-power, giving her a speed of thirteen knots.

In England, in the meantime, progress in screw propulsion had caused the Admiralty to revise its ideas. It adopted the propeller of one of Ericsson's rivals, Francis Pettit Smith. The paddle-sloop *Rattler*, under construction, was converted. Completed in 1843, among other tests she was lashed stern to stern to the paddle-sloop *Alecto*, of equal horse-power; each ship went full speed ahead, and the *Alecto*, her paddles vainly thrashing, was towed backwards by the screw at a speed of over two knots.

News from France, whose imagined warlike intentions were raising absurd alarms, hastened the inevitable. A 40-gun frigate with a famous name, the *Pomone*, then being built, was fitted with Ericsson's screws. In 1844 the Admiralty put in hand two large screw ships of this class, the *Arrogant* and *Dauntless*. The *Arrogant*'s engines were of low power, and intended to be auxiliary, but the *Dauntless* was given full steam power. For reasons to be noted, she did not prove satisfactory, but she was the first ship in the Royal Navy (the *Rattler* being regarded as experimental) designed to fight under steam.

2

In that year, 1844, the navy had in commission or laid up in ordinary more than eighty sail of the line and sixty-five frigates. Since the beginning of the century, the administrative reforms enforced by St. Vincent, the creation in 1811 of the School of Naval Architecture, and the appointment of Surveyors to the Navy with scientific qualifications, had wrought great improvements in the royal dockyards. In 1832 restrictions upon tonnage were lifted, and the size of every class of ship increased. While the term tonnage remained in use, the age-old method of calculating a ship's burden, an internal measurement, was now being superseded by that of computing the amount of water she displaced.

Scientific design resulted in a marked advance in the sailing

qualities of our ships, but in one most important respect there was no change. The navy was still armed with the improved version of Henry VIII's demi-cannon. The 32-pr. was still the standard heavy gun, though in 1840 ships of the line were given an additional 68-pr. mounted on a pivot in the forecastle as a bow-chaser. All guns fired solid shot, case and grape.

Throughout the world, in fact, the naval gun remained primitive, uncertain and limited in its action—until 1837. In that year, to the two factors which already foreshadowed the end of the wooden sailing ship—steam power and the iron hull—a third was added. The French navy adopted the shell gun.

The shell of the period, like the gun, was a very old model. It was a large form of hand-grenade—a hollow sphere filled with gunpowder, which was exploded by a short length of time fuse projecting from the surface. The only type normally used at sea was the bomb, fired from a mortar. With this weapon, since the burning fuse projected beyond the muzzle, it could be extinguished or cut if there was any hitch in discharging the bomb. In a long gun a shell was terribly dangerous; the lighted fuse could not be quenched, and if the discharge was unduly delayed the shell would explode in the barrel. A Russian squadron is said to have destroyed Turkish ships in the Black Sea in 1788 by shells thrown from howitzers or carronades; but when the French navy in the Revolutionary wars tried to fire shells from guns, premature explosions were numerous, and after a score of ships, including two-deckers, had been burnt, blown up or badly damaged from this cause, with great loss of life, the lesson was taken to heart. The British Admiralty had always set its face against the use of large incendiaries of any kind, except by bomb-vessels, and even the throwing of hand-grenades from the tops was officially discouraged.

It was in 1824 that a shell gun invented by Colonel Paixhans, of the French army, was first tested at Brest. With cast-iron shot it was still necessary to allow a gun a certain amount of windage, because the projectiles were never perfectly spherical, and had therefore to fit the bore loosely; Paixhans made use of this defect, the fuse of the shell being ignited by the flames of the explosion when the gun was fired. Until the discharge, the shell was perfectly safe. This was the new and alarming weapon with which the

French began to arm their fleet in 1837, and at once every other navy was virtually rendered obsolete until it could produce a shell gun of its own. The *Canon-obusier*, unlike the mortar, was a genuine gun, a broadside piece with a flat trajectory; and a few shells, to say nothing of a whole broadside, would set a wooden ship in flames.

To quote an American writer on naval matters, 'It was an old maxim in the British Admiralty that Great Britain ought never to initiate any naval innovation destined to render existing material obsolete, but that she should be prepared to outstrip any other power that might introduce such a change.'* France was the only other power whose navy Britain had to take seriously, and she had become extremely sensitive to innovations introduced in that service. The shell gun, in any case, revolutionized naval warfare, and something had to be done about it at once. There were feverish experiments at Woolwich, and in less than two years an answer to the *Canon-obusier* had been designed—an 8-inch gun firing a 56-lb. spherical shell. This was a lighter gun than the 68-pr. pivot, also of 8-inch calibre, and required a smaller propelling charge. The fuse was ignited by the method devised by Paixhans.

Perhaps because production took some time to meet the demands of the biggest fleet in the world, this gun does not seem to have been generally adopted before 1850. But by the time the Crimean War broke out it had replaced the old-type 32-pr. as the lower-deck gun of our ships of the line. As the tonnage of these had continued to increase, the 32-pr. went upstairs, superseding the 18- or 24-pr. on the middle or upper deck. Large frigates were given a main battery of shell guns.

All other navies with any claims to be up to date had adopted the new weapon, and before we or the French had occasion to test it in action, its devastating powers against the existing type of warship were again demonstrated in the Black Sea. On 30 November 1853, a Turkish squadron of frigates and corvettes lying carelessly at anchor in the harbour of Sinope, on the Asiatic shore, was attacked and destroyed by six Russian ships of the line and some frigates from Sevastapol. Eleven out of twelve Turkish ships were set ablaze by shells.

Though the fight was hopelessly one-sided, this holocaust

* Bernard Brodie, *Sea Power in the Machine Age* (O.U.P., 1941).

made every thinking naval officer wonder what the future held for the wooden ship—or, indeed, for the iron ship, as then constructed. As the action at Sinope was the curtain-raiser to the Crimean War, the two most powerful navies in Europe, our own and that of France, were soon too fully occupied to consider comprehensive measures to counter the shell gun, but one was obvious—the use of some kind of armour; and to meet the immediate emergency the French designed a batch of ironclad floating batteries with steam motive power. The lesson of Sinope was driven home when the allied fleets came under shell-fire from the guns of Sevastopol, and was further underlined when, in October 1855, the floating batteries were employed with striking success at the bombardment of Kinburn. Once more we were reluctant imitators, building four similar craft, iron-hulled and propelled by steam; but the war ended before they were ready for service.

The idea was not novel; the French themselves, always inventive, had tried something of the kind during the long siege of Gibraltar in the 1780s, in a vain attempt to defeat the fortress's red-hot shot. But these new ironclad contraptions, also designed for a special purpose, and all but unmanageable at sea, were one thing; it was quite another to decide how whole navigable fleets were to be protected. And the question was tied up with the other revolutionary and controversial problems already coming to a head—the future of steam power, still in an elementary stage, the case for iron, as distinct from armour, in ship construction, and the prospect (a start having been made with the shell gun) of great but as yet unforeseeable developments in artillery. In short, in times to come what sort of fleet would have to be protected, and against what sort of gun?

3

To take these problems in order, as they affected the British navy, progress with the screw propeller hung fire for some years. The *Dauntless* was a disappointment, her screw and her 580 horse-power giving her a speed of only ten knots. Paddle-steamers of the same power were faster, and the advocates of the paddle crowed loudly. The reason for this failure was not understood at

the time. The *Dauntless* was built like any other warship of the sailing era, with bluff bows and stern. This form of stern did not allow a sufficient flow of water for the screw to grip. Twin screws would have met the difficulty, but though Ericsson had fitted two screws to his launch for the famous trip up the Thames, the idea does not seem to have been considered in connexion with large vessels. Our first twin-screw warship was not to be built for another twenty-five years. A single screw, however, could be made perfectly efficient, as engineers soon realized, by getting rid of the bluff stern, giving this fine underwater lines.

The final impulse to the adoption of the screw came, like so many others, from the French. The ten years between 1840 and 1850 saw British naval opinion being gradually converted to a belief in steam power. At the beginning of the decade it was not thought that this would ever supersede sail. By 1845 it was admitted that steamships formed an important arm of the service. But it was still a subsidiary arm, limited to the frigate class and under, and the battle between paddle and screw had not been decided. Then, in 1850, the French launched a screw first rate, the *Napoléon*, with powerful engines of 940 horse-power and a speed of twelve knots. The game of follow-my-leader was resumed, and the 91-gun *Agamemnon* became the first British ship of the line designed for steam and the screw.

At the same time other sailing battleships being built were converted to steamers, as were some of the newer two- and three-deckers already afloat. Boilers, machinery and coal took the place and supplied the weight of the heavy ballast needed by all big sailing ships. The engines of the period consumed an immense amount of fuel in relation to horse-power, but there was enough space for this to render a fleet semi-independent of sail if cruising within a reasonable distance of a home port. While only two of the ten British ships of the line in the Black Sea in 1854 had steam power, Admiral Napier, in the Baltic, had thirteen steamers of this class to six sailing battleships. Senior officers who had grown up with a sailing navy would not admit that canvas was now auxiliary to steam, but this was the fact; and before the next crucial date in this era of constantly accelerating change, the year 1858, almost the entire British navy was wholly or partially steam propelled.

In outward appearance its wooden ships of the line differed little from those that had fought at Trafalgar and the Nile and on the Glorious First of June. They had grown bigger, and there were two-deckers of a hundred and one guns (the odd gun being the 68-pr. pivot in the forecastle). They had funnels, which could be lowered when a ship, conserving her fuel, was under sail, and the lines of their sterns, below the quarter galleries, overhung the water and came to a sharp edge at the rudder-head, instead of being bluff. If their lower-deck guns fired shell, up above were the old 32-prs., direct descendants of the demi-cannons of the *Henry Grace à Dieu.* They were magnificent, but already they were anachronisms; and when, in the summer of 1856, the last ships of the allied fleets left the Black Sea, only a few years remained to run before the biggest three-deckers would be dwarfed by monsters of iron.

Yet in the British navy the end of the wooden ship, so near at hand, was still only a topic for theorists. By 1850 that navy included seventeen iron ships, the largest being six in the sloop or small frigate class. One of these was the ill-starred *Birkenhead*, of 1400 tons. All were paddle-steamers. No more were built, for in that year the second problem engaging progressive naval thought, the case of iron versus wood, was decided by the Admiralty—in favour of wood. The decision was not affected by the lessons of the Crimean War. Wooden ships had proved helpless against shell guns in forts, while on the armour of the French floating batteries shells had exploded harmlessly, and the heaviest round-shot bounced off it. But these clumsy contrivances were not ships, and the maxim still held good that the world's most powerful fleet, numerically, should not initiate innovations that might whittle down its supremacy. It was pointed out that while the thick sides of wooden ships were designed to keep out round-shot, these went through the thin skin of an iron hull as if it were paper, and so would shells; and except for her hull, a so-called iron ship was a mass of wood. All that the war had proved was that ships were unfitted to engage forts armed with shell guns. There had been no fleet action. In one, or so presumably the argument ran, shell-fire would cut both ways.

Reluctant though the Board of Admiralty was to adopt upsetting novelties, it had done so when it copied the French floating

batteries, and these having proved their worth against the dreaded shell gun, it is extraordinary that the Board does not appear even to have considered the use of armour on conventional ships. As the navy returned to a peace footing, more wooden battleships, protected only by their stout timbers, were being laid down.

Within two years, the Board was to be roughly awakened. The impulse, as usual, came from across the Channel.

4

In spite of the recent alliance, the ambitions of Napoleon III continued to be regarded with deep suspicion in Whitehall. Any increase in French naval estimates was taken as a threat to our sea power. In the first months of 1858 relations between the two countries were under strain because of the Orsini plot against the Emperor's life, which had been hatched by exiles in England. The Admiralty had then for some time been backing experiments in the field of artillery development, the third major problem affecting the navies of the period, and it was now much perturbed by news that experiments on similar lines were being carried out in France.

The idea of the rifled gun was not new; it had been proposed by Benjamin Robins a hundred years before artillery officers in Sardinia and Sweden actually designed such weapons in the 1840s. We had followed with the Lancaster gun, but when this was employed in the siege of Sevastopol it acquired a bad reputation for jamming, and, what was worse, for bursting. Then, in 1856, William Armstrong's rifled field-piece successfully passed its tests, and with official encouragement the designer began to make bigger rifled guns for naval use.

It was not the rifling, but the way these guns were constructed that was Armstrong's great contribution to the development of ordnance, the basic principles of his design having been followed ever since. For centuries the best guns had been made of cast iron, and the best process for casting iron was a British trade secret, but even British iron-founders could not overcome the limitations of this metal. It is deficient in toughness and tensile strength, and cast-iron guns were restricted in size to a point beyond which increased pressure of the propelling charge would

overcome any additional thickness of the barrel. The naval 68-pr. was considered to be the biggest gun that could be used with safety. As long as guns were made in one piece, they had to be of cast-iron or brass; Krupp had made a light steel gun before 1850, but steel was not yet to be depended upon. What Armstrong did was to employ the new resources of metallurgy to go back to the built-up gun, last heard of in Henry VIII's time.

Like this archaic weapon, his gun was a breech-loader made up of several parts—essentially, the steel barrel, or 'A' tube, a series of wrought-iron jackets shrunk over this, and the separate steel breech mechanism. The breech was closed by a screw. Faults in the steel led to the substitution of wrought-iron barrels until the adoption of the Bessemer process a few years later. When the gun was built up, it was rifled by boring, the number of grooves increasing with the calibre of the bore.

Rifling had already introduced a new form of projectile. Spherical shot and shell were superseded by cylinders with a flat base and a rounded or conical head. These having been inserted in the breech, the propelling charge in cartridges was pushed in after them, a reversal of the process necessitated by muzzle loading. A coating of lead on the projectile, later reduced to a ring of copper, was forced into the grooves of the rifling; there was thus no windage, and the spin imparted to the cylinder further increased accuracy and range. These elongated shot were considerably heavier than equivalent round-shot, that of Armstrong's 7-inch gun weighing a hundred and ten pounds to the sixty-eight pounds of the 8-inch smooth-bore, but with ten degrees elevation the range of the two guns was much the same, about four thousand yards. The 3-pr. of Armstrong's rival, Joseph Whitworth—in time the names were to be linked—when given an elevation of thirty-five degrees had the enormous range for those days of over five miles. Good shooting with rifled guns was aided by an entirely new type of sight invented by Armstrong; fitted to the breech in pairs, each having an eye-piece and a graduated scale, one giving degrees and the other yards, these sights contained the germ of the idea of the modern range-finder.

In place of the primitive time fuse, shells for rifled guns were fitted with percussion fuses which were screwed into the nose of

the projectile until the invention of the armour-piercing shell, when a home had to be found for them in the base. The fuse composition detonated on impact or had a timing mechanism.

In the course of a few years Armstrong manufactured a whole range of rifled naval breech-loaders—110-, 70-, 40-, 20-, 12- and 6-prs. With the 7-inch 110-pr. the fashion was set of classifying heavy guns by their calibre, instead of by the weight of their shot. The breech mechanisms of these early models had defects which in time were to bring on one of the reactionary fits to which the British navy was still prone; but in the first months of 1858, the Admiralty being in no hurry, none had been adopted by the service. A number had been sold to foreign powers. That one of these was France did not worry the Board; the more the French navy depended on British products the better, since in an emergency supplies could be cut off.

Reliance on this state of things, however, was no preventive against infection by yet another invasion panic in which the country was indulging, an aftermath of the Orsini plot being bellicose manifestoes by French colonels. Weighing up the naval situation, the Admiralty discovered with alarm that the French had as many steam battleships as Britain, and that in steam frigates they had taken the lead. Another jolt followed—they were experimenting with rifled guns of their own. Cast-iron muzzle-loaders, these guns were never to pass the experimental stage, but the Admiralty took them so seriously that it hastened to get down to business with the Armstrong firm.

It took less seriously at first another piece of news received even before it had decided what guns it wanted. The French, having proved the value of armour on floating batteries, did not leave the matter there. The Director-General of Construction of the French navy was Dupuy de Lôme, of whom one of his opposite numbers in Whitehall said: 'In boldness of conception and in executive skill he takes the first place among the naval constructors of our time.' Dupuy de Lôme was a strong advocate of armour, and in 1857 he was instructed to go ahead with his plans for an ironclad sea-going fleet.

CHAPTER THIRTEEN

From the *Gloire* to the *Monitor*

1

THE famous *Gloire* was not a new ship. She started life as a wooden, steam two-decker of ninety guns, probably the *Napoléon*, the first screw ship of the line. Three vessels of this class were simultaneously converted into ironclads and renamed, and the *Gloire* achieved fame because she was the first of them, in their new form, to be ready for sea. At the same time Dupuy de Lôme designed a fourth armoured ship, of the same force, built throughout of iron.

The Gloires had their upper gun-decks removed. They were lengthened by some twenty feet and given a belt of iron from stem to stern, four and a half to five inches thick, with a heavy backing of oak. This armour covered the main battery on the single gun-deck, and descended below the waterline. Displacing 5700 tons, these ships had a speed under steam of thirteen knots. They were given a fore-and-aft rig, dimensions of masts and spars being much reduced because of the reduced freeboard. Masts and funnel had a pronounced rake. The Gloires appear originally to have been armed with the experimental 16-cm., rifled muzzle-loaders that proved unsatisfactory. They were then given Armstrongs, and still later 12-cm. breech-loaders of French design.

These four armoured ships were under construction in 1858. It was soon known that they were the start of a very ambitious programme; another ten or twelve were to be laid down in French yards in the next five years. But in British naval circles what was in fact the opening of a new era in warship construction was generally regarded as a visionary experiment. At the Admiralty, usually so sensitive to French naval innovations, there was still no belief in armour. It consumed weight better put into guns.

In this obscurantist mood the Board failed, however, to reckon with a new element in the situation. For centuries the two service departments had gone their own ways in their own small pro-

fessional worlds. Newspapers being luxuries, passed round among small groups of readers while their news grew stale, critics and reformers in Parliament were voices crying in the wilderness. Public opinion, so far as it existed, had no concerted means of expression—until 1836. In that year the fourpenny stamp duty on periodicals was reduced to a penny; and in tens of thousands of homes, for the first time, what had happened only a day or two before could be discussed at the breakfast table. In particular, prompt and widespread publicity given to Parliamentary debates on topics of national concern, such as foreign policy or defence, brought swift reactions of popular feeling which may well have surprised even those whose long fight for a free press was at last all but won. Ministers and their departments were made aware that an incalculable force, hitherto ignored except during elections, must now constantly be taken into account.

Its full horrors were first experienced by the War Office during the Crimean War. It was now the turn of the Admiralty. While the Board was concerned only with the recovery of our superiority in steamships and armament over the French navy, to a large and growing body of newspaper readers the name of the *Gloire* had become a household word. Questions and debates in Parliament strengthened the belief that Napoleon III was building an iron-clad fleet to destroy our own; accordingly we must build one too, and a better one. Such was the outcry that the government bent to the storm, and the Admiralty had to cast overboard its most cherished ideas about the future of the British battle fleet.

To do it justice, its conversion was thorough. Early in 1859 fourteen private shipbuilding firms were invited to submit designs, in competition with the Admiralty's own Chief Constructor's department, for an iron-hulled armoured ship having the high speed of at least thirteen knots, capable of overwhelming any warship then afloat or building. Of the designs sent in, one was for a ship of no less than 11,000 tons; only one provided for a displacement below the 7000 tons of our latest three-deckers.* The Chief Constructor's design was adopted, and in May that year, just before the *Gloire* was completed, our first ironclad, the *Warrior*, was laid down. A sister ship, the *Black Prince*, was begun in October.

* Oscar Parkes, *British Battleships, 1860–1950* (Seeley, Service, 1957).

Both were built at private yards, the royal dockyards having then no experience in iron construction except on the smallest scale. Ten years later, our ironclad fleet—excluding converted wooden ships and two purchases—consisted of eighteen ships privately built and thirteen products of Portsmouth, Chatham, Pembroke and Woolwich.

The biggest warships in the world, for their day they were remarkable vessels. With a displacement of 9210 tons, the *Warrior* attained a speed of over fourteen knots, the *Black Prince* one of thirteen and a half knots. As the former was designed before the Admiralty had made up its mind about the Armstrong breech-loaders, her single gun-deck had ports for forty 68-pr. muzzle-loaders; both ships, however, were eventually given Armstrongs. Guns and engines were protected by 4½-inch wrought-iron armour backed by eighteen inches of teak. It was a serious defect that this belt was only partial; the stern and bow being unprotected, the steering gear and rudder-head were exposed. Because a space of fifteen feet between guns was insisted upon, the gun-deck was immensely long, and the overall length of three hundred and eighty feet made the pair unhandy at sea. Both were, of course, fully rigged, and in appearance were very graceful vessels, their square glazed frigate sterns and knee bows—the 'schooner' bows retained by some liners until the end of the century—linking the passing age with the more utilitarian future. When completed they were the most powerful as well as the largest warships afloat, though the French contended that the wooden Gloires, smaller and slower but with a continuous armour belt and only two hundred and fifty feet long, were handier and more efficient.

Like the *Gloire* herself, the *Warrior* is remembered because she was the first ironclad to be commissioned in our navy. Before the *Black Prince* was ready for sea two smaller Warriors, only partially protected, and another six iron ships with continuous belts of armour, had been laid down in British yards. Three of 11,000 tons were four hundred feet long, and shared the Warriors' unhandiness at sea. In an attempt to counteract this defect when under sail, an experiment was tried that makes the *Agincourt*, *Minotaur* and *Northumberland* unique among modern warships; they were given five masts, the two aftermost, with their fore-and-aft rig, being in fact the old bonaventure mizzens revived.

The French were still going ahead with wooden-hulled ironclads, and to reduce their lead in armoured ships, in 1861 the Admiralty ordered six two-deckers still on the stocks to be converted by being cut down, lengthened, and plated from bow to stern to the height of the single gun-deck left to them. The first of this group, the *Prince Consort*, ex-90-gun *Triumph*, was launched in 1862. Though the six were a temporary expedient, to raise the numbers of the battle fleet while more iron ships were building, the performance of the *Merrimac* in Hampton Roads helped to cause a short-lived reaction in favour of wood, and several new wooden ironclads were designed at this time. Under the same influence, one of them, the 8000-ton *Lord Clyde*, incorporated a weapon that was mistakenly to dominate naval thought all over the world for the rest of the century. Her armoured belt was carried down at the bows to form a blunt ram.

All these immediate successors in European navies of the *Gloire* and the *Warrior*, whether their hulls were of wood or of iron, belonged essentially to the type of ship that fought under Nelson and Blake and against the Armada. They had steam and armour, and the weight of the latter meant the end of two- and three-deckers, but these screw-propelled ironclads still relied on broadside fire. The ram having been introduced in our navy, the *Bellerophon*, begun in 1863, was given two guns in her bows and an increased arc of training to those in her main battery, but the battery was amidships. A necessary complement to the ram was a powerful volume of fire delivered straight ahead.

A means of achieving this, and more than this—all-round fire—had triumphantly passed its test in action in 1862. Every navy began to think in terms of turret-ships, and in 1863, as it happened, the British navy acquired two by chance.

Partly because one of the Law Officers of the Crown went out of his mind, a fast steamer, built on the lines of a sloop-of-war, slipped away from Laird's yard at Birkenhead before legal action to stop her could be taken, and became the Confederate States' cruiser *Alabama*. When, on top of this, and of what the American ambassador in London considered other infringements of neutrality, he was told that he need not worry about two ironclad turret-ships, generally known as rams, *El Mousson* and *El Monasir*, nearing completion at the same yard, since they were

for the Pasha of Egypt, he knew better. If they were allowed to sail, to hoist the Confederate flag as soon as they were outside territorial waters, he reminded the authorities that this would be an act of war. The Law Officers being now in their right minds, our only available armoured ship, the brand-new *Prince Consort*, was given a scratch crew and sent to cruise off the Mersey. A gale having driven her into Kingstown, the delicate business of the turret-ships was closed by their purchase for the Royal Navy. Renamed *Scorpion* and *Wivern*, they were ships of 2750 tons with continuous belts of armour and two turrets amidships, where hinged bulwarks could be lowered to give the turret guns a field of fire. The turrets were armed with pairs of 68-prs. A forecastle and poop made them good sea-going vessels, and with their high fuel capacity and speed of eleven and a half knots they would have been formidable opponents for the United States' navy. They were barque-rigged, and the *Wivern*'s fore and main masts were fitted with a novel feature—wooden struts instead of the shrouds that would have masked her turret guns. This form of tripod mast, repeated in other turret-ships of the time, was to be revived, for a different reason, forty years later.

2

When John Ericsson, once known to the Admiralty, was still a young officer in Sweden, he thought of a 'device for aquatic attack' which was in fact the revolving gun-turret. It seems to have been after his arrival in the United States that he made a model of a very odd-looking craft embodying this invention. The American navy did not know of it then, Ericsson's connexion with the service soon ending as the result of a quarrel with Captain Stockton, who had sponsored the screw propeller. Each had designed a 12-inch wrought-iron gun; Ericsson warned Stockton that the latter's design was faulty, and when the gun blew up on the quarterdeck of the new *Princeton*, killing the Secretary of State, the Secretary of the Navy and other dignitaries, the Swede refused to defend Stockton's arithmetic. Stockton saw to it that he suffered for this, and being merely a genius, without prophetic powers, he swore that he had done with the United States' navy for ever.

When the Crimean War began, Ericsson remembered his 'aquatic device'. The British navy having once rebuffed him by rejecting his propeller, through the offices of the Swedish consul in New York he submitted plans and sketches to Napoleon III, but failed to rouse the Emperor's interest. The model of the 'device' remained in Ericsson's New York workshop, to accumulate dust, and the inventor turned to the properties of heat and the patenting of a 'caloric' engine.

He was a man of fifty-eight when the Southern States began to secede from the American Union. With the secession of Virginia, in April 1861, the Federal government lost its finest navy yard, at Norfolk, at the mouth of the James River. A number of ships immobilized there had to be scuttled and set on fire. By far the most powerful in commission was the 44-gun, steam, wooden frigate *Merrimac* (or correctly *Merrimack*), whose engines were under repair.

The new Confederacy had no navy whatever, and no means of creating one in the conventional sense. Two naval lieutenants who had gone with their states—their names, Brooks and Porter, deserve remembrance—proposed that the hull of the *Merrimac* should be raised and that she should be turned into an ironclad. The resources of the dockyard being little damaged, this was done. The frigate was given a long casemate with sloping sides and ends, which was armoured with four inches of rolled railway iron on a thick timber backing. It had ports for ten heavy guns, rifles and smooth-bores. Forward of it the deck was given a few inches of freeboard and fitted with a ram. Only a funnel, a small pilot-house, and a flagstaff rose from the roof of the casemate. In her new form the *Merrimac* was rechristened *Virginia*, but her career was so short that she is always known by the mis-spelling of her old name.

The situation of Norfolk, on the James River, gave her a special task. Both the new Confederate government at Richmond, Virginia, and the Federal authorities at Washington, attached great importance to the naval blockade of the Confederacy proclaimed by President Lincoln at the outbreak of war. Now, a year later, owing to sheer want of ships to watch more than three thousand miles of coast, the blockade was still very imperfect. The Richmond government maintained that it was not a true

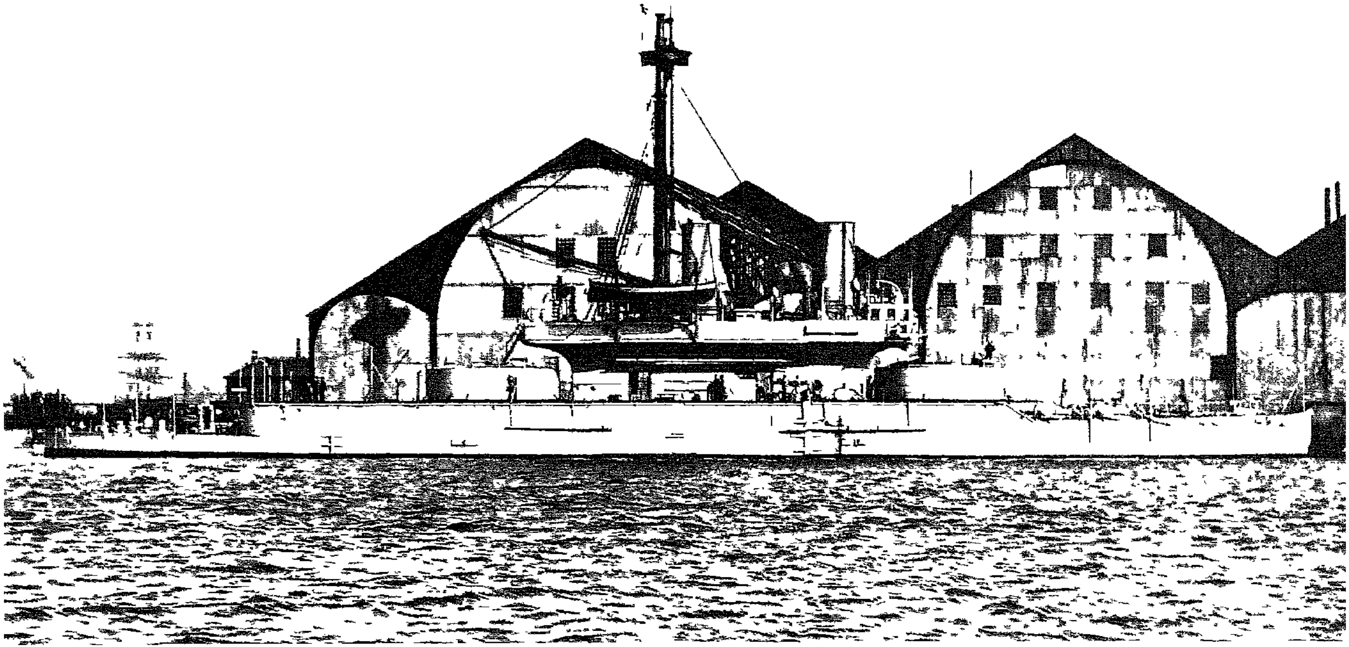
blockade. The James being the waterway to Richmond, the United States' navy kept a powerful force in and outside Hampton Roads, its estuary; it was the first task of the *Merrimac* to destroy these ships, and so show to the world that the blockade was a farce.

News of her transformation, no doubt greatly exaggerated, reached Washington that August. The most modern ships of the United States' navy were four wooden, screw frigates of the heavy type it had favoured from its early days—the *Merrimac* had been a fifth—a number of screw sloops and some paddle-steamers. Old sailing frigates and sloops were still in commission—the famous *Constitution* had been laid up as recently as 1855—and were regarded by senior naval officers as the only units that could rightly be called ships. The more realistic Navy Department, at once taking alarm, formed a board to consider designs for armoured vessels that could cope with the Confederate ironclad. One accepted design was to become the *New Ironsides*, a very large frigate with a central, plated box-battery. But she would take a year or more to build; the urgent need was for something that would take only a few months. John Ericsson had the answer; now that the country of his adoption was at war, he forgot his ill-treatment by the navy, rummaged in his workshop for the model of his 'aquatic device', dusted it, and took it to Washington.

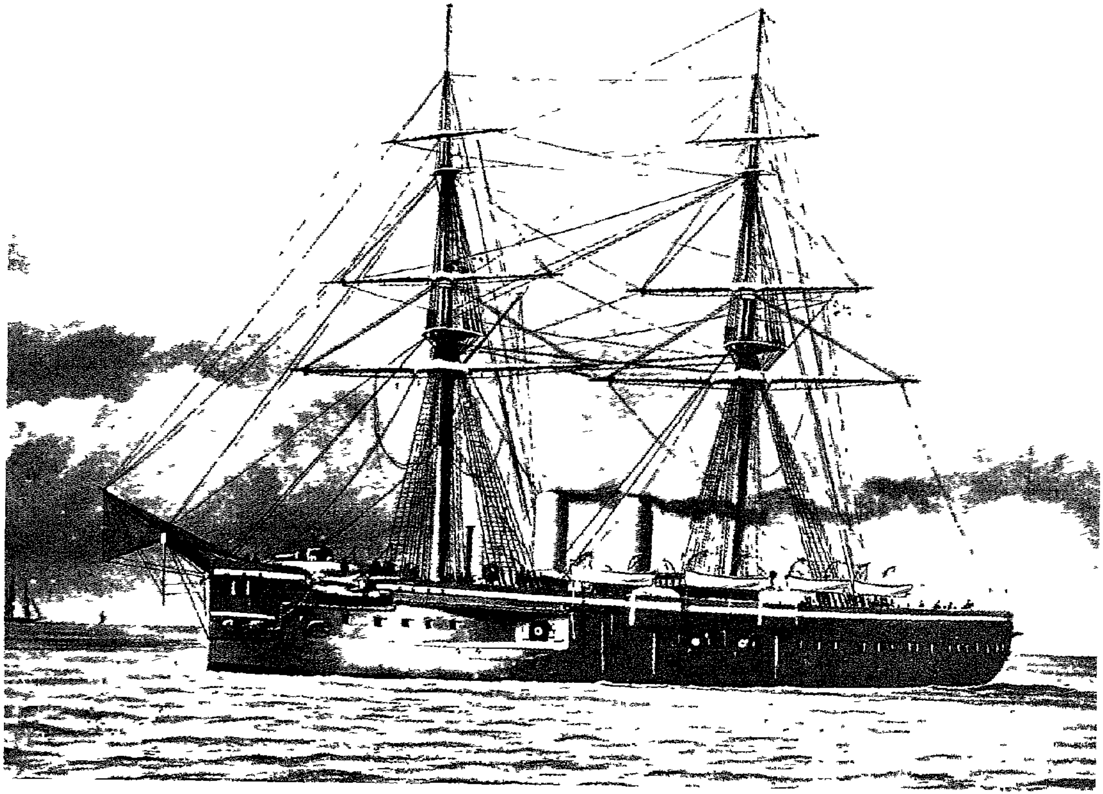
As a ship it was so extraordinary that it was viewed by professional circles with doubt and derision. The commander-in-chief of the armed forces, however, who was the President, was less hide-bound. With one of his characteristic remarks—'There seems to be something in this, as the girl said when she put her leg in the stocking'—Lincoln recommended the sceptical members of the board to give the oddity further consideration. No other design submitted met the vital requirement, the time factor, and in October, in a New York shipyard, the building of the *Monitor* was begun.

She was launched within a hundred and one days of the signing of the contract, and was completed, or at any rate put together, by February 1862. No vessel like her had ever been seen. Much altered from the original 'device', she was a mass of novelties, including more than forty entitled to basic patents.* But it was

* Bernard Brodie, *Sea Power in the Machine Age*.



H.M S *Devastation*, 1873



H.M.S. *Téméraire*, 1877. The only British barbette ship rigged for sail

the fundamental idea behind her strange appearance that is Ericsson's chief claim to fame. In the *Monitor* a powerful armament was concentrated in the smallest and least vulnerable target ever seen afloat.

The young officers who converted the *Merrimac* were far ahead of naval thought of their time when they dispensed with masts. Ericsson's contract required him to furnish 'masts, spars, sails and rigging'. He ignored this clause. The *Monitor* was described as a 'cheese-box on a raft', and when the crew of the *Merrimac* saw her they took her for a floating water tank. As she would have to navigate the shallows of the James estuary, her draught was only ten and a half feet, her hull being 'an elongated shallow tin pan'. On this was laid a lightly armoured deck, a hundred and seventy-two feet long, almost flush with the water; its overhang protected the hull, having five inches of plating, and was carried well aft of the screw. There was nothing above the deck but a central revolving turret, a small pilot-house or conning-tower in the bows and two funnels which were removed in action, when smoke escaped through gratings in the deck. Because of the pilot-house, the turret guns could not fire straight ahead; otherwise they had an all-round fire. The ship's engines, astern of the turret, filled that part of the hull from keel to deck, and living conditions on board were appallingly cramped.

Fully laden, with her guns and ammunition, the *Monitor* displaced about 1200 tons. Her designer's engines, with cylinders transmitting power by rocking arms, gave her a theoretical speed of nine knots, but this was halved when her funnels were taken down. Her *raison d'être*, the turret, nine feet high with an internal diameter of twenty feet, was built up of eight 1-inch layers of iron; in it were two 11-inch Dahlgren cast-iron smooth-bores, weapons designed for shell, but now given 166-lb. round-shot. Ericsson had hoped for the 15-inch Dahlgrens put on later monitors—the name became generic—but none were ready in time. Heavy iron stoppers, swung from the roof, closed the gunports when the guns were run in for reloading. The turret was turned by a central spindle worked by its own engine; as the rim of the circular wall rested on a bronze ring in the deck, the whole mass of iron had to be raised slightly by the spindle before it could rotate. Accounts which speak of the turret 'revolving

rapidly' are rather misleading, and as the gun-crews, from want of time to train them, took at least seven minutes to reload, the *Monitor*'s rate of fire at its best was leisurely. With well-trained gunners, the 15-inch Dahlgrens were reloaded in three minutes. When solid shot were first fired from the 11-inch, guns the propellant charge of 15 lb. of powder was too weak; however, it was found that a 30-lb. charge could safely be used, with a great increase of hitting power.

Hasty construction accounted for the position of the *Monitor*'s little pilot-house. A tight fit for the wheel and three men, it was built like a log cabin of baulks of iron nine inches thick. It was later put on top of the turret, an arrangement followed in the *Monitor's* successors.

Remarkable economy of means was a feature of Ericsson's design. The *Monitor* had a complement of twelve officers and forty-five naval ratings, all volunteers. Her opponent, the *Merrimac*, required a crew of three hundred and twenty, almost all being drawn from the Confederate army.

In common usage as a generic term since 1862, the name *Monitor* was Ericsson's own choice. He had made his peace with the United States' navy, but the British Admiralty's rejection of his propeller still rankled after sixteen years. 'To the Lords of the Admiralty', he wrote, 'the new craft will be a monitor, suggesting doubts as to the propriety of completing those four steel-clad ships [the two Warriors and their two immediate successors] at three and a half million a piece. On these and many other similar grounds I propose to name the new battery "Monitor".'

Put together so hurriedly out of parts made in different works all over the country, the *Monitor*'s trials were nightmarish. Everything went wrong. When eventually, on 6 March, she steamed through the Narrows into the Atlantic, her crew had not learnt to handle her numerous gadgets. Ventilation failed, and in rough weather off Sandy Hook water poured into her. Nevertheless, on the afternoon of the 8th, a Saturday, her commander, Worden, brought her into Chesapeake Bay. He could hear gun-fire, and he steamed on into Hampton Roads as dark fell and the glow of flames reddened the sky. It is one of the striking coincidences of history that he had come just in time.

Though the senior officers of the squadron blockading the James River should have known all about the *Merrimac*, they did not share Washington's alarms. On that Saturday morning the squadron was disposed in the most careless manner. The only ships readily handled in an emergency, two of the steam frigates, were lying outside the bar of the James, one with her fires drawn. Inside, in Hampton Roads, off Newport News on the north shore, were the sailing frigate *Congress* and the big sailing sloop *Cumberland*. They could look straight down the Elizabeth River, on the south shore, to Norfolk and its navy yard, five miles away. When, early in the morning, a dark flat shape which was the *Merrimac* was seen steaming towards them from Norfolk, both ships were at anchor, their sails furled, their rigging hung with washing. They do not seem to have attempted to make sail, though it took the slow ironclad an hour to cross the James. She made for the 24-gun *Cumberland*, firing shells from the two 7-inch rifles in the forward end of her casemate. The sloop replied with broadsides of solid shot, which bounded off the *Merrimac*'s armour. The ironclad rammed her, leaving her ram in the *Cumberland*'s side as she backed away. The *Congress* had now belatedly made sail, but at once ran aground. While the *Cumberland*, firing to the last, heeled over and sank with the loss of a hundred and thirty of her crew, the *Merrimac*, which drew twenty-four feet, took up a position in the deep-water channel from which she could rake the *Congress*. The frigate was unable to bring a gun to bear; after an hour's deliberate shelling she was thoroughly ablaze and had a hundred and twenty men killed and wounded, and she struck her flag.

In the meantime the steam frigate *Minnesota*, coming to the rescue, had in turn run herself hard on a shoal. The *Roanoke*, a sister ship of the *Merrimac*, and later to be converted into a three-turreted monitor, being unable to make steam was taken in tow by a tug, as was the sailing frigate *St. Lawrence*, the wind being very light. Before either could get into action, both ran aground. Four ships out of five, in an anchorage that had been their navy's principal base, had thus contrived to immobilize themselves—clear evidence of the bewilderment, amounting to panic, which seized their commanders and navigators. All four were fortunate; the day was drawing on, and the tide ebbing,

and after firing a few shells at the *Minnesota*, the *Merrimac* steamed away to Sewell's Point on the south shore of the estuary to repair the hole in her bow where her ram had been, and to repair other trifling hurts. The heavy broadsides of the *Cumberland* had disabled two of her guns, killing or wounding ten men. But she was perfectly fit for action. She could return on the flood tide in the morning to finish her work.

She got under way to resume the engagement again at 8 a.m. on the 9th. The *Roanoke* and *St. Lawrence* had been got afloat; the *Minnesota* remained firmly on the mud, a helpless victim. Near the still smoking wreck of the *Congress* was lying a small object, the supposed water tank. This began to move, steering for the Confederate ironclad.

Having replaced her damaged guns from the stocks in the navy yard, which had already armed forts all along the coast of the Southern states, the *Merrimac* had two 7-inch rifles, two 6-inch rifles, and six 9-inch smooth-bores. The *Monitor*'s two 11-inch guns were much less effective than they might have been because of the weak charges used. But the *Merrimac* was at a great disadvantage. Her commander had come out to destroy more wooden ships, and he had no solid shot in his magazine, only shells.

To the enthralled watchers on the many craft lying in the roads, however, the ensuing fight appeared to be a case of David and Goliath. The *Merrimac*'s long casemate loomed enormous beside her small opponent's single turret. The action lasted for four hours, with a break towards the end when the *Monitor* withdrew into shallow water to replenish the ammunition in the turret, which had to be stationary while more was hoisted from below. The two queer vessels fought at very close range, circling round one another like sparring boxers at a very slow speed, and firing at a very slow rate. The *Merrimac*'s shells being quite ineffective against the turret-ship's armour, she made attempts to ram, but the *Monitor* was the less unhandy of the pair, and eluded her. The big Dahlgren guns, on the other hand, at the very start gave the *Merrimac* a shock in every sense; two 11-inch shot struck the casemate together, and though they failed to penetrate the 4-inch railway iron, they broke it, splintering the timber backing and throwing every man on that side of the

battery to the deck. In the second and shorter phase of the action the *Merrimac*'s gunners changed their tactics, concentrating their fire on the small target of the *Monitor*'s pilot-house. It had been hit several times when Worden, peering through one of the slots, was half-stunned and temporarily blinded by the blast of a shell. He was able to pass an order by the unreliable speaking-tube for the ship to sheer off. The *Merrimac* had by this time lost her funnel and most of what little speed she had; her armour was started in several places, and two of her port-shutters were jammed. She was thankful to crawl back to Norfolk.

In about three hours' actual fighting the *Monitor* fired forty-one shot, six or seven to the hour per gun. Almost all are said to have hit, the range being usually only a matter of yards, and the ships sometimes touching. She herself was hit twenty-two times, mostly on the turret. If her fire was slow, that of her opponent, which could bring five guns to bear on a broadside and two ahead, would appear to have been very much slower or very wild. The *Merrimac*'s casemate, however, was a huge target, and the turret relatively a very small one, while shells glanced off its cylindrical wall before bursting. The value of armour could not have been more dramatically demonstrated; in spite of ranges recalling the muzzle-to-muzzle fights between wooden ships, not a man was killed on either ironclad, and only Worden was seriously injured. Cuts by splinters, and cases of concussion, made up the rest of the casualty list. Things might have been very different, in the opinion of the *Merrimac*'s officers, if the Dahlgren guns had been given the heavier propelling charge later employed. The improvisation of railway iron must then have been battered in, and the *Merrimac* would probably have been sunk.

As things were, in the role of a blockade-runner she and her type were proven failures. Across Hampton Roads, the real meaning of what in a sense was a drawn battle was perhaps dimly grasped that evening. An American historian has written of it: '*Monitor* came back to her berth beside *Minnesota* with the crew of the frigate cheering her till they were hoarse; Lincoln sat beside Worden's bedside with tears in his eyes; and twenty more monitors were ordered on the spot.'

CHAPTER FOURTEEN

The Turret and the Ram

1

MORE has been written about the *Monitor* and the *Merrimac* than about any other ships in the world. The story is still worth re-telling, not only for the obvious reason, the influence of their meeting upon the development of the modern warship, but because, at the time, that influence worked in erratic ways that are scarcely remembered now. The host of precedents set up by the novel vessels themselves were points for discussion in every navy; more far-reaching were the general conclusions drawn from the action. On both sides of the Atlantic its lessons were misunderstood.

In Washington, the destruction of the *Cumberland* and *Congress* caused something like panic. The seaboard cities of the North seriously expected to be laid in ashes by the *Merrimac*'s guns, just as, thirty-six years later, they expected to be bombarded by Cervera's cruisers. As extravagant a reaction followed, and it was believed that monitors could do anything.

In London, when there had been time to digest accounts of the two days' fighting in Hampton Roads, the potentialities of the *Monitor* and her 11-inch guns were almost as wildly exaggerated. Already in a state of alarm about the supposed intentions of Napoleon III, Parliament had voted twelve millions for the improvement of coastal defences. All this, it was now said, was wasted money. Turreted ironclads could steam into our harbours and batter expensive fortifications to rubble with impunity. A suggestion by one Member foreshadowed the shape of things to come—the only answer to floating batteries was floating batteries. For the government, a Minister expressed the hope that there were grounds for believing that a complete revolution in the art of war was not to be feared. In a few years fixed batteries would no doubt regain the ascendancy over the most powerfully armed ironclads. Making the rash assertion that smooth-bores

were better than rifled guns, the speaker betrayed a lack of knowledge apparently shared by his hearers; he thought the Dahlgrens were rifles.

Even an intelligent man like Ericsson, in a moment of enthusiasm, seems to have thought that his 'device' had rendered the whole British navy obsolete, and the press of the Northern States of the Union, where Britain was not popular, gleefully drew the same conclusion. It was common to every European country with a coastline; all conventional navies would be helpless against flotillas of ironclad turret-ships. There was something in this, but why an inconclusive single-ship engagement should cause it to be taken for granted everywhere that existing land defences were all but useless is now difficult to understand. After the example of Kinburn, where the French floating batteries were mainly instrumental in silencing a big fort, there was no rush to build more and better craft of this type; and though the *Merrimac* really belonged to it, no navy went in for improved *Merrimacs*. The true function of the turret was not yet fully grasped, but some magic in Ericsson's invention stirred the imagination and the fears of the world's navy departments, and one and all prepared to defend their country's ports by building turret-ships to fight turret-ships.

The right thing was being done for the wrong reason. It was from these coast defence vessels, never needed, that the battleship of the future was to develop.

2

In 1861, before the *Monitor* was laid down, a small turret ship, the *Rolf Krake*, was built in a British yard for the Danish navy. She was designed according to the ideas of a retired British naval officer, Captain Cowper Phipps Coles.

The claim that Coles invented the revolving turret independently of Ericsson, and earlier, does not, however, bear examination. The 'device' had been in Ericsson's mind when Coles was a child; 'The plan I sent to the Emperor,' Ericsson wrote in a confidential letter, 'was the result of my study from my youth'—dating apparently from 1826.* In important respects the model differed

*W. C. Church, *Life of John Ericsson* (1892).

from the famous ship built at New York in 1861; it had a whale-back deck and semi-spherical or cupola turrets. In 1854 the French and British navies were acting in concert, and information was freely exchanged between them. Coles, who had already made a name as a man of ideas, was then serving with the allied fleets in the Black Sea. It was only after the Crimean War that he began to push his proposals for turret-ships, and they embodied features in Ericsson's model—the curved deck and the cupolas—which the Swedish engineer later discarded.

Coles was a man of the same type as Ericsson's one-time colleague, Stockton—the gifted amateur. He had a considerable knowledge of engineering, and a fertile and original mind. Some of his minor inventions and improvements were adopted by the navy. Full of enthusiasm for whatever he took up, he inspired others with it. A flair for publicity was to have a tragical outcome. Like Stockton, Coles had not the technical equipment to carry out his most ambitious design. The careers of the two men were strangely similar; both ignored warnings that their arithmetic was faulty; the big gun that one designed blew up, and the ship that was the other's pride and joy proved to be top-heavy, and capsized.

In the first years of the turret-ship, however, Coles's drive and enthusiasm had much to do with its rapid adoption by European navies. Failing to convert the Admiralty to his belief in revolving cupolas, he sold the idea to the Danes. The *Rolf Krake* has been wrongly described as a monitor; she was a masted ironclad of 1340 tons, a small edition of the Laird rams. Her turrets were not cupolas but of the *Monitor*'s pill-box type.

She had barely been launched when the *Monitor* burst upon the world. Coles found himself a justified prophet in his own country. The Admiralty was soon under public pressure from all directions; one school of thought demanded large numbers of coast defence turret-ships, and was supported by anxious cries from the outposts of empire; a second school held to the old and tried doctrine that the best defence of our shores was a strong sea-going fleet, and that if we were to have turrets, they should be on battleships. Sober professional opinion, in any case, felt that a single action between entirely novel craft was not enough to go on; we must wait and see. A rather superior attitude towards American naval affairs became an intense interest in everything

that could be learnt about them. It was, in fact, a unique opportunity for lookers-on; a highly inventive and enterprising people, with no respect for tradition, was fired by the action in Hampton Roads to prodigies of effort and ingenuity in developing new naval weapons.

The North, with great resources, had already built a fleet of armoured gunboats on the Mississippi, some of them in a few weeks. The South turned river steamers into rams. Without the backing of big industry, it contrived to build ships of the *Merrimac* type in extraordinary conditions. The *Arkansas* was somehow put together in an almost uninhabited swamp on the Yazoo, and the *Albemarle* in a cornfield in North Carolina. While at New York work on the *Monitor* went on day and night, a species of submarine had been built for an attempt to sink the *Merrimac* at her berth in Norfolk navy yard, but the vessel was too crank to be submerged; before long, however, in Charleston harbour, devoted men were drowning in hand-propelled submersibles called 'Davids', dredged up to be manned again, and after several crews had perished they at last succeeded in sinking the U.S.S. *Housatonic*. Another new weapon had been used, the torpedo, carried at the end of a spar. A spar-torpedo in the bows of a steam launch later sank the *Albemarle*. There was no end to novelties; together with the twenty new monitors of 1862 the experimental *Keokuk* was under construction—a ship with a turtle-back deck and two fixed turrets or towers armed with pivot guns. She was one of the failures, and another was the wooden frigate *Roanoke* when turned into a turret-ship; three turrets and 5-inch armour increased her displacement to 6300 tons and reduced her speed to five knots.

But it was upon Ericsson's new monitors that Northern shipbuilding resources, and the attention of the world's navies, were primarily concentrated. When the facts about the fight in Hampton Roads had been sifted from fiction and fancy, the limitations of vessels of the *Merrimac* type began to be realized. Had her weakly engined successors built for the Confederacy been the products of well-equipped shipyards, and adequately powered, the type was still too clumsy to work with sea-going fleets. It was a projection of the floating battery—a means of coast defence. The early monitors were not sea-going vessels either; the famous

prototype sank in a gale off Cape Hatteras before she was a year old. But as a class they had endless possibilities.

The next eight were of similar design, but larger. The single turret had eleven inches of armour, and was armed with one 11-inch and one 15-inch Dahlgren. The pilot-house was on top of the turret. Six more single-turreted ships followed, the displacement now reaching 1800 tons. These were all shallow-draught vessels, difficult to handle, if not dangerous, in a sea. Before the end of the war an altogether different type was in commission. The *Dictator* and *Puritan*, though still having only one turret, were big sea-going ships, with a draught of twenty-one feet, and designed by Ericsson to have a large coal capacity and a speed of sixteen knots. They did not reach this, being altogether too heavy in the water, but at the same time several smaller and excellent sea-going double-turreted monitors were built. Except for the second turret, and a light bridge joining the pair, they scarcely differed in appearance, or as targets, from the *Monitor* herself, their decks being at the most two feet six inches above the water. This was the type that developed after the Civil War. The *Miantonomoh*, a ship of 3800 tons, crossed the Atlantic, the sea being often all over her deck to a height of four feet. Another of this class afterwards sailed round the Horn.

A dozen of the Civil War monitors were still in service for harbour defence when the United States went to war with Spain in 1898, and some of their immediate successors figured for this purpose in the American navy of 1914. Soon afterwards the British navy was building authentic monitors for anti-battery work in the shallow waters off the Belgian coast, and some of these, again, were in commission when a second World War began in 1939. Ericsson's 'aquatic device', in something like its original form, had lasted well.

3

Information about the novel warships multiplying in American waters reached Europe in a scrappy and often unreliable form. Two misconceptions took a firm hold not only of popular opinion but of most European naval thought—that coast defence ships and the ram would play a big part in naval warfare of the future.

That its conditions in the Civil War were peculiar and local was not fully appreciated. Much was heard about ramming, because, except for the blockade, naval operations were confined to inland waters—the Mississippi, the Carolina Sounds, enclosed anchorages like Hampton Roads and Mobile Bay—where room for evasive manoeuvring was cramped. Both combatants built or adapted scores of fast river vessels as rams. The wooden ram *Queen of the West* and her sisters had no guns at all. Given a little time, first impressions would no doubt have been greatly modified, but before the question could be critically examined, the Battle of Lissa, fought in the open sea, was assumed to clinch arguments for the ram as an essential weapon in all circumstances. The craze for coast defence ships sprang mainly from delusions about the powers of the turreted ironclad. It was fostered by the use made of the *Merrimac*'s successors, most of which were built to protect the ports upon which the Confederacy relied for supplies brought in by blockade-runners.

It need hardly be said that in adopting the new fashions the French were the earliest in the field. In 1863, only a year after the fight in Hampton Roads, the first of five coast defence ships, the 2456-ton *Taureau*, was begun at Toulon. The next four were a thousand tons bigger. All were of wood, mastless, with a low freeboard, a continuous belt of armour, a very prominent ram, and a single turret—fixed in the *Taureau*, revolving in her successors. The infection spread rapidly. Within another year or two not only coast defence but sea-going turret-ships were being built, mostly in British yards, for the Dutch, Prussian, Italian, Brazilian and Peruvian navies. The Russians built their own, including a number of monitors of Ericsson's type.

In Whitehall, however, the Admiralty still held its hand. The evidence from the other side of the Atlantic was conflicting. In April 1863, there was a set-back for those who maintained that turret-ships would demolish fortifications with ease. Against the opinion of the admiral in command, and of Ericsson himself, who agreed that ships could not do the job without the co-operation of a landing force, the most powerful squadron of ironclads yet seen was sent into Charleston harbour to knock its ring of forts to pieces and capture the port. The flagship was the *New Ironsides*, and with her were seven monitors and the

turtle-backed *Keokuk*. After two hours' cannonading the squadron withdrew; it had done very little damage, and had suffered a good deal. The monitors had been hit again and again, some at least forty or fifty times, while their own rate of fire was still very slow. Turrets were jammed, guns disabled, pilot-houses smashed. The experimental *Keokuk* sank that evening from her injuries, having received, by one account, ninety hits. She was, however, very lightly armoured; in general, the protective value of armour was once more fully proved. Seventy guns in the forts succeeded in killing only one man.

Some of these guns, including two 7-inch, being rifled, another problem that had been causing the Admiralty some concern was emphasized. In 1861 the navy had been given its first breech-loaders; on the Warriors the broadside smooth-bores were replaced by Armstrong 40-prs., and the 68-pr. pivots by 110-pr. rifles. Armstrong had originally designed his rifled guns for field artillery, to give this increased range and accuracy; hitting power was of no importance to an anti-personnel weapon firing shell. It now appeared that with the quick-burning powder then used a rifled gun's elongated solid shot were much less effective against armour than round-shot from a smooth-bore of equal calibre. The Palliser armour-piercing shot for rifles were produced in 1863, but the poor penetrating power of the early breech-loaders helped to bring about the unfortunate abandonment of this weapon only two years later.

Though the muzzle-loader was then to come back into favour in the British navy, service opinion had some anxious moments about the existing type during the American Civil War. The bogy of all navies in the future, the see-saw between guns and armour, was already foreseen, and news of the big Dahlgrens roused great interest and some uneasiness, our most powerful naval gun being still the 8-inch 68-pr. When in Hampton Roads the *Monitor*'s 11-inch Dahlgrens failed to penetrate four inches of railway iron at ranges of a few yards, it was not known that they would take double the propelling charge used, and confidence in the 68-pr. was restored. It was still the best and most reliable armour-piercing gun in the world. This comforting belief was shattered two months after the failure of the attack on the Charleston forts. In Warsaw Sound, on the coast of Georgia, an improved

Merrimac, the *Atlanta*, had been built to break the blockade of Savannah. To find money for her, the ladies of the city sold their jewels. As soon as it was known that she was ready for sea, two monitors, the *Weehawken* and *Nahant*, were sent to intercept her. In June 1863 she steamed down the Sound escorted by a fleet of small craft filled with spectators to cheer her victory. A broadside missed the *Weehawken*; at three hundred yards the monitor replied with her pair of guns, an 11-inch and a 15-inch, both given their full charge of powder. The 15-inch shot went clean through the *Atlanta*'s armour, killing or wounding sixteen men and throwing forty more to the deck. Another 11-inch cracked the armour; a second 15-inch demolished the pilot-house and the helmsman. The *Atlanta* ran on the mud and struck her flag. The *Weehawken* had fired five rounds, the *Nahant* none at all.

This was disturbing. On top of the shortcomings of the Armstrong breech-loaders, which besides inadequate hitting power had a faulty breech mechanism, it was now clear that the 68-pr. was outclassed by the 11-inch Dahlgren, to say nothing of the 15-inch, while one of 20-inch calibre was in production. Guns of this size, to be safe, could not be cast by the old methods; the process employed chilled the barrel's interior first, the exterior cooling slowly upon this hardened core—very much as the jackets of Armstrong's built-up guns cooled and shrank upon the 'A' tube. The Palliser armour-piercing projectiles would have given the breech-loaders the required hitting power, but before they were issued the defects in the latter's breech mechanism caused a series of accidents, and the Admiralty was already thinking of reverting to muzzle-loaders of an improved type.

These were rifled guns originally designed by Armstrong and built up in the same way as his breech-loaders. The retrograde step was taken in 1865, when the Woolwich 6½-ton, rifled muzzle-loader was issued to the navy. Of 7-inch calibre, it threw an elongated shot of a hundred and twelve pounds. The 12-ton, 9-inch gun followed. With these weapons, in our navy the nomenclature of ordnance changed again and guns were classed by their weight in tons. Except for the smaller types, 20-prs. and under, breech-loaders disappeared from our ships. The building-up process virtually put no limit to the size of muzzle-loaders, and they grew fantastically big; but for fifteen years, while they did

so, the navy's armament lagged behind that of most other naval powers.

4

After the fight in Hampton Roads the Board of Admiralty must sometimes have wished that America had never been discovered. A nation that still took pride in its naval power and prestige was easily worked upon by propaganda insisting that its ships were out of date, and with the monitors as their text, Captain Coles and his supporters in Parliament and in the press clamoured for turreted ironclads, both for coast defence and for sea-going fleets. The campaign roused popular feeling overseas, the colonies and India awakening to the defenceless state of their harbours.

One of Coles's ideas, borrowed from the U.S.S. *Roanoke*, was the conversion of wooden ships of the line into low-freeboard ironclads for coastal defence. He had now raised such a storm that to keep him quiet he was given a free hand with the 120-gun *Royal Sovereign*. A very similar iron ship, the *Prince Albert*, was also to be built under his supervision.

The *Royal Sovereign*, cut down to her lower gun-deck and given four turrets, attracted much publicity. Queer notions were held about the new conditions of naval warfare, and *The Times* remarked of the stowing of hammocks on the tops of the turrets that they would form 'capital rifle-pits'. Like all of Coles's designs, the vessel embodied ingenious details, but she was never more than a curiosity. Her iron-hulled sister ship, the *Prince Albert*, lingered as a unit of the navy until the early 1880s, but in almost complete obscurity. It is clear that she was hardly a success and the *Royal Sovereign* was as clearly a failure. From these examples the Admiralty may have drawn conclusions about Coles's limitations as a naval architect. His next and much more ambitious project, a design for a big sea-going turret-ship, at first met with no official encouragement whatever.

Publicity had by now, however, made Coles something of an international figure. His reputation was enhanced when in 1864 Prussia and Austria wrenched the Schleswig–Holstein duchies from Denmark, possession of the only ironclad in those waters, the turreted *Rolf Krake*, enabling the Danes to score a minor

success at sea. Coles was then commissioned to design a rather similar ship, the *Huascar*, for the Peruvian navy. Built by Laird, she had a single turret forward, in which were two Armstrong 12½-ton, rifled muzzle-loaders, a continuous armour belt, watertight compartments and a ram. Brig-rigged, she was given an iron tripod foremast. Completed in 1866, the *Huascar*'s first performance, the voyage to Peru through the Straits of Magellan, was a triumph for Coles. If there were doubts about his ability to design big ships, he was successful with small ones. A vessel of only 1100 tons, with a freeboard, when her hinged bulwarks were raised, of no more than nine feet, in the Pacific the *Huascar* took torrents of water on deck, but proved thoroughly seaworthy. In the course of an adventurous career she was to see more fighting than any warship of her day, and she was to remain in service until she was in her seventies.

1866 is an important year in the history of the ironclad. It was a busy one for British naval shipbuilders. The Admiralty had given way to the demand for coast or harbour defence vessels, and in addition to work in hand for foreign powers, three of this type were laid down that year for colonial service, and a fourth for home defence. A fifth was in the design stage, and more were to follow. All deriving from the *Monitor*, and the forerunners of our battleships of the future, they will be better dealt with later; 1866 is most noteworthy for events in the Adriatic, because of their influence on that future. A ship just completed in a British yard was to play a brief and inglorious part in them.

5

The *Affondatore* was built at Millwall for the Italian navy. She is usually called a turreted ram, the ram being a very prominent feature of her design. An iron ship of 4100 tons with 5-inch armour, she had pole masts and a main armament of two Armstrong 300-pr. M.L.s, each in a turret. The little *Huascar* was as heavily armed, but for offensive action the *Affondatore* relied on her twenty-six-foot ram. She was completed in the spring of 1866, and later was dispatched to the Adriatic.

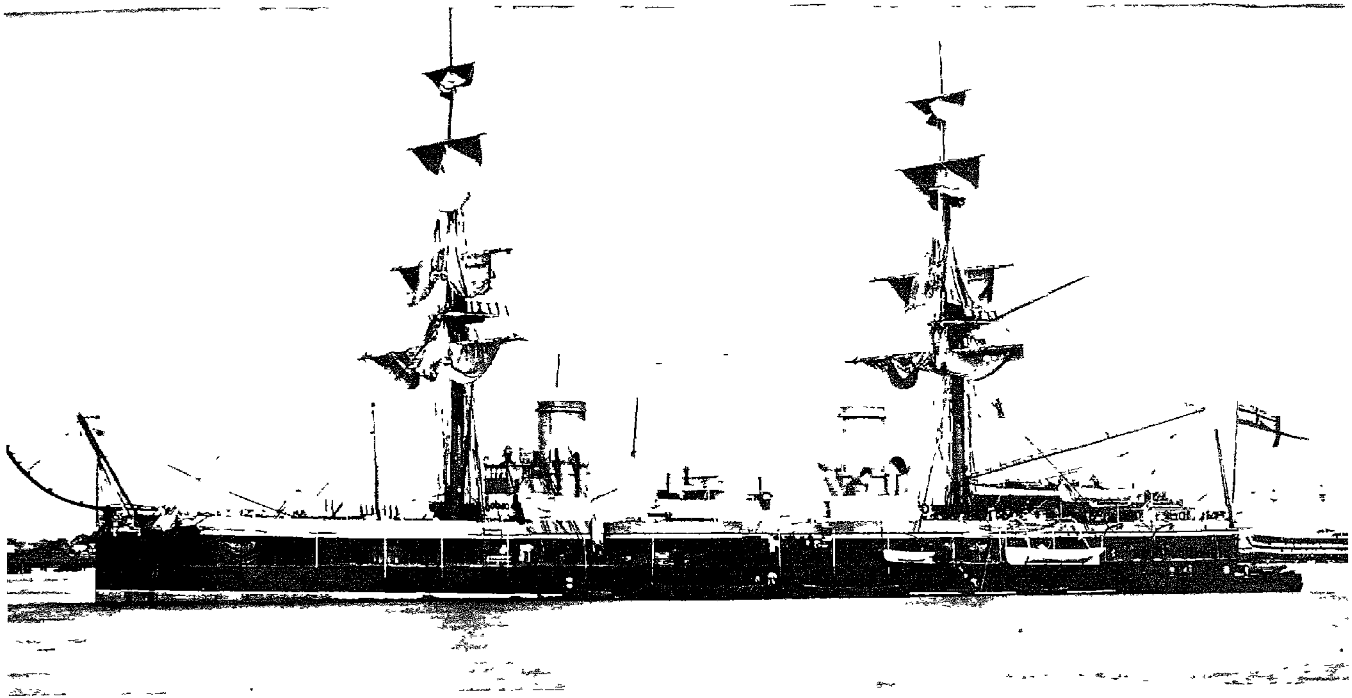
When, in June, Italy went to war with Austria, she appeared to be much the stronger at sea. Her fleet, with the *Affondatore*,

included twelve armoured ships, four being of iron, to the Austrian seven, all wooden. Both fleets were armed mainly with Armstrong muzzle-loaders, but the Italians had an enormous preponderance in rifled guns. Their ships, however, were a medley of types, the crews were ill-trained, and the Italian admiral, Persano, was a vacillating commander who seems to have had no tactical plan for battle. He had an extravagant faith in the *Affondatore*, and would do nothing without her. When war was declared she was still in the Thames, and did not join him for another month.

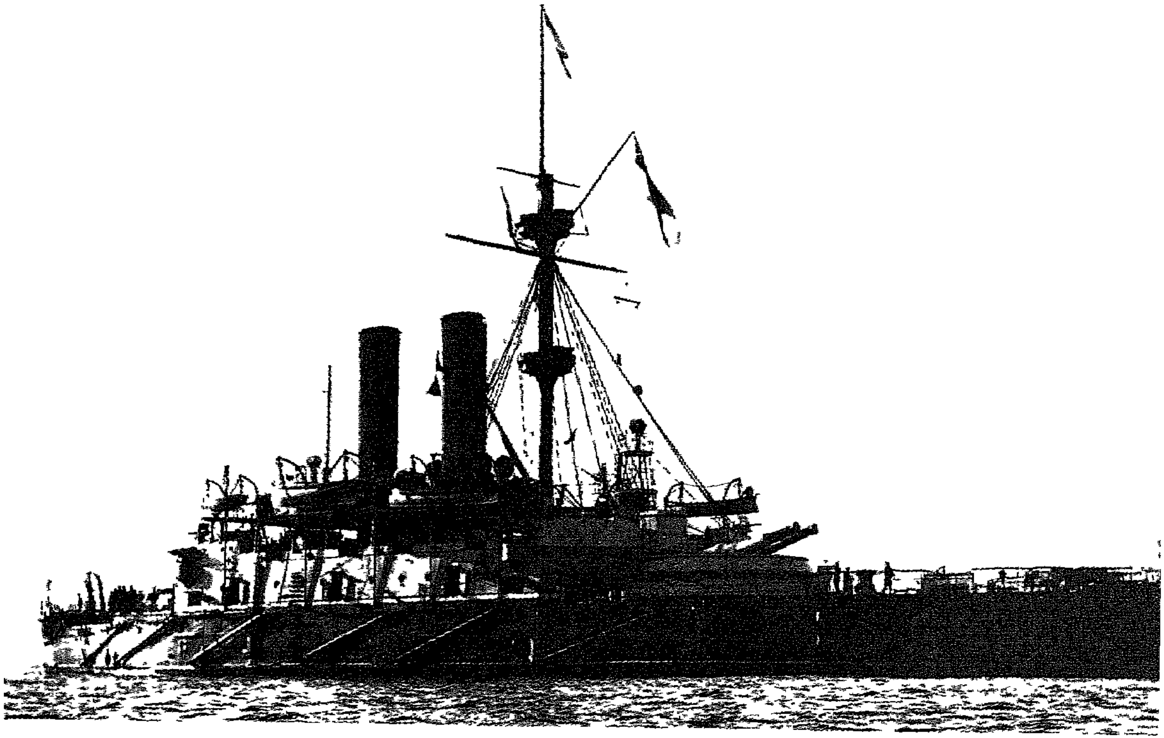
The Austrian admiral, Tegetthoff, was a very different type. He knew exactly what he meant to do in a fleet action, and an action was what he sought. Persano, waiting for the *Affondatore*, and without confidence in himself or in his subordinate commanders, kept out of the way of the Austrian fleet until the middle of July, when the Italian government fairly drove him to sea. A battle had been lost on land, at Custozza, a truce was imminent, and a naval victory was needed to restore Italian prestige. For a start, Persano was ordered to bombard and capture the Austrian island of Lissa, off the Dalmatian coast. This was bound to bring Tegetthoff down upon him, and since the Austrian admiral's character and intentions should have been known, it would have been more rational to order Persano to seek him out, instead of wasting ammunition and endangering his ships in a contest with forts. But the Italian conduct of the whole of these operations is a text-book example of how things should not be done.

When the bombardment of Lissa began on 18 July, the old lesson was repeated—the damage inflicted by the ships' batteries was more spectacular than serious. That evening Persano learnt, from an intercepted message, that Tegetthoff was leaving Pola to come to the aid of the island. He did nothing about it. The next morning the anxiously awaited *Affondatore* joined the fleet; the bombardment was resumed, and in the evening preparations were made to land troops on the 20th. But the Italians were to be otherwise occupied that day. At eight in the morning the only scouting vessel Persano had thought it necessary to send out, patrolling a mere twenty miles to the north of Lissa, came flying in with the news that she had sighted the Austrian fleet.

Few commanders, knowing that the enemy's fleet was leaving port, only some seventeen hours' steaming away, determined to



H.M.S. *Inflexible*, 1878



H.M.S. *Collingwood*, 1882

force an action, can have been less ready for it than Persano. One of his ironclads had gone off to Ancona to repair serious damage and refill her magazine; the rest were so scattered that another did not rejoin until the fleet was forming, and a third not until the fighting was over. On several ammunition and fuel were running low. Persano had with him a number of wooden frigates and smaller craft, but they took no part in the coming battle. Left with ten ironclads in hand, he hastily formed line ahead, in three divisions, each of three ships, heading north-east. The precious *Affondatore*, given a roaming commission, was stationed to starboard of the central division.

Tegetthoff had left Pola on the 19th with every ship he could lay hands on. His order of sailing was his order of battle—three columns of divisions in double quarter line disposed astern, or, more simply, in three wedge-shaped formations, one behind the other. The leading wedge was composed of his seven wooden ironclads, his flagship, the *Erzherzog Ferdinand Max*, being at the apex. She and her sister ship, the *Habsburg*, the biggest and newest of the seven, were vessels of just over 5000 tons. Both were without heavy Krupp breech-loaders ordered for them. They had blunt rams, but were not specially designed for ramming; Tegetthoff, however, in view of his inferiority in gun power, had issued a general order for his ships to ram the enemy. Seven unarmoured ships formed the second wedge, steaming about five cables, or a thousand yards, behind the first; only the 92-gun *Kaiser*, which led, was above the frigate class. For his third division Tegetthoff had scraped up eleven smaller craft, including two Imperial yachts carrying a few guns.

Of the nineteen ironclads in the two fleets, all, except the *Affondatore*, were broadside vessels, typical of their day. In general they were fully rigged, with the big tops and heavy spars of the sailing era, but the new *Ferdinand Max* and *Habsburg*, both Austrian-built, showed an advance in design, their three tall masts dispensing with tops, sails and yards, except one yard for signalling purposes. Both were notable for their lofty funnels. The Austrian ships were painted black, the Italians grey.

On that morning of the 20th the Adriatic weather was rough, with squalls of rain. About nine o'clock the Austrian fleet, coming from the north, appeared on the Italians' port bow. Tegetthoff

led his division straight for the Italian line, still getting into formation. He was nearing it at nine knots when Persano, at the head of his central division in the 5700-ton *Re d'Italia*, threw the ships astern of him into confusion by stopping his flagship, lowering a boat, and going on board the *Affondatore*. The rest of his fleet did not know that he had done this, and from that moment he lost control of it.

A further result of his action was to create a wide gap between his leading and central divisions. At 10.50 a.m., having repeated by signal his order to his captains to ram 'everything grey', Tegetthoff led his seven ironclads through the gap. While with four ships he then turned to port, parallel with the Italian van, the other three engaged the enemy's centre. The old *Kaiser* led her wooden ships against the Italian rear division. Almost at once the battle became a mêlée, the Austrian ships, and some of the Italians, attempting to ram. Even the gunboats and yachts of Tegetthoff's third division got into the fight. The Italian unarmoured ships, which had the excuse of protecting transports, kept out of it.

The lasting influence this battle was to exert upon naval thought seems the more surprising because if it proved anything it was that ships under steam can as a rule easily avoid being rammed. Again and again, in a mêlée lasting an hour and a half, attempts were made to ram. The *Ferdinand Max* succeeded in making contact with the *Palestro* and the *Re d'Italia*, but struck them only glancing blows. A shell set the *Palestro* on fire, and she hauled off in a cloud of black smoke. The old *Kaiser* found the *Re di Portogallo* under her bows, and gallantly crashed into the ironclad, doing little harm but suffering much herself. On fire, with more than a hundred dead and wounded on her decks, she steamed out of the fight to repair damage, but she was ready for action again the next morning. The *Affondatore* had been designed to ram, and Persano, who set such store by her, cruised about in the smoke among the scattered crowd of ships, repeatedly trying to use her formidable prow, but always missing his stroke. She was a raw ship, with a raw crew. Once only was the ram successfully used, and then against an almost stationary target.

Half an hour after Tegetthoff broke through the Italian line, the steering gear or rudder-head of the *Re d'Italia* was damaged

by a shell. Her engines seem to have been stopped when the *Ferdinand Max* loomed out of the smoke to port. The Austrian admiral, who supposed that Persano was on board the ship drifting across his own flagship's bows, ordered full speed ahead to ram. As the *Ferdinand Max* worked up to eleven knots, the *Re d'Italia* also went ahead, but then, unfortunately for her, her captain changed his mind and went astern; she was scarcely moving when the Austrian ironclad, stopping her engines at the last moment, hit her squarely amidships. The blunt ram made a huge hole in her armour over the engine room. On the *Ferdinand Max* men were thrown about by the shock. She backed immediately, withdrawing her ram; the *Re d'Italia*, laid over to starboard by the blow, heeled to port and within a few minutes went down. Nearly two-thirds of her crew of six hundred sank with her.

Confused fighting, with more vain attempts to ram, went on until about midday, when the two fleets had become widely dispersed. Tegetthoff, whose weaker unarmoured ships had withdrawn from the fray with the battered *Kaiser*, collected his ironclads and formed line ahead. Some of the Italian captains, discovering that their admiral had not gone down with his flagship, rallied about the *Affondatore*. Others were so distant that they seem to have taken an hour or two to rejoin. Early in the afternoon, when the fleets, under easy steam, were some miles apart, the *Palestro*, still burning, blew up. Persano then steamed away to Ancona; Tegetthoff did not pursue, but took his ships into the harbour of San Giorgio, the port of Lissa.

He has been criticized for not renewing the action. But he had gained a victory, which was what his government required. Within three weeks an armistice put an end to hostilities. Though the Italians had lost two ships, they were still in superior force, and markedly so in fire power. Their gunnery had been very wild, but they still had a hundred and seventy rifled guns of 6-inch calibre and upwards, whereas the Austrian guns were mostly low-calibre smooth-bores. Tegetthoff may well have felt that he was lucky to have escaped with the little damage his ironclads actually suffered. He had no reason to suppose that the Italians were demoralized, though their admiral certainly was; their crews had fought well enough, even heroically—that of the *Palestro* refused to leave her, and perished almost to a man.

Advocates of the unarmoured ship, and there were still British naval officers opposed to protection gained at the expense of fire power, can have gleaned small comfort from the Battle of Lissa. Upwards of six hundred lives were lost with the *Re d'Italia* and *Palestro*, but only eight, plus forty injured, in the ten other Italian ironclads engaged. On the seven Austrian ironclads the killed numbered three, and the wounded thirty. Casualties on the unarmoured *Kaiser* totalled a hundred and twenty-three. Her ninety-two guns had not availed her.

It is said that the Italians often fired their guns unshotted, a mistake very possible with muzzle-loaders manned by ill-trained and excitable crews. The Austrian smooth-bores appeared to make no impression on the enemy's armour, but Tegetthoff had trained his gunners to fire converging salvoes, and these may have been more effective than was realized at the time. Persano's fleet had barely got back to Ancona when the *Affondatore* sank at her moorings, apparently from injuries received.

CHAPTER FIFTEEN

The Years of Experiment: I

1

In the story of ironclad development the early years are little remembered now. They seem very old history, like the beginnings of the locomotive or of the steam-engine itself. The French have not forgotten the *Gloire*, nor the Americans the *Monitor*, but then comes a long blank. In Britain, the origins of the Grand Fleet of the First World War are scarcely traced back beyond Lord Fisher's *Dreadnought*.

The newest fighting ships in that war represented almost the last word in the gradual evolution of established types that had been in progress for thirty years. It ended in the anti-climax of the Battle of Jutland. In treating the subject as a whole, as a connected story, the earlier years, the first twenty-five or so, are in one sense infinitely the most interesting. There were no established types. Precedents were created almost yearly. In every navy it was a period of ceaseless experiment and endless variety.

By a happy coincidence for the British navy, the year 1860, when our first ironclads were being built, saw the founding of the (now Royal) Institution of Naval Architects, which was to do for British shipbuilding what the older Royal Institution of Civil Engineers has done for scientific constructional work on land. Though in the beginning the Board of Admiralty took some persuading, the service, to a far greater degree than the mercantile marine, stood in need of the collective knowledge and advice of the best engineering brains in the country. It was about to launch itself upon what may fairly be described as an uncharted sea.

As it happened, a vital question was settled almost at once. The American Civil War and the Battle of Lissa determined the type of warship of the immediate future. Every navy adopted, if only for limited use and not always correctly, the turret, the ram and the mastless ship. But how from these beginnings the type would develop, at so early a stage of the new era no one could say.

Far-seeing men realized that future progress would not only be constant, but would constantly accelerate. Guns would get more and more powerful. To defeat them, armour would become thicker and heavier, increasing the displacement and the size of ships. Engines would have to keep pace with this increase, and at the same time with demands for higher speeds. There were all sorts of constructional problems. Steel, like the new warships themselves, was in the experimental stage, and wrought-iron was not only the normal material for a ship's hull but was to remain the basis of armour until the invention of steel alloys. Iron has its limitations, and in the 1860s there was still a lot to be learnt about it, especially in the royal dockyards.

The engines of this period derived from James Watt's double acting or reciprocating engine, in which steam is alternately injected and ejected on either side of the piston, both strokes doing work. Compound engines, of two or more cylinders of unequal size, steam from the smaller filling the larger by expansion, had come in in the 1850s; the first ship in the Royal Navy successfully fitted with compound engines was the *Pallas*, a small wooden ironclad completed in 1866. Condensers had by then done away with the trouble caused by salt deposit from sea water in the boilers, and these, which had begun as rectangular boxes in which the heated gases passed through flat pipes, had become cylindrical and the flues tubular. Ten years after the navy adopted the compound engine, this was to be further improved by forced draught and triple expansion, ideas borrowed from the French and said to be the only instances of such borrowing by British designers of engines from a foreign source.

During the experimental stage of the ironclad, from the late 1850s to the early 1880s, these developments raised steam pressures from twenty-five pounds on the square inch to a hundred and twenty-five, and indicated horse-power in the battleship class from the *Warrior*'s 5470 to the 9500 of the *Collingwood* of 1883, whose displacement exceeded that of the older ship by less than one-sixteenth. The term 'indicated horse-power', or the actual power developed by an engine or set of engines, officially replaced in 1872 the arbitrary 'nominal' horse-power adopted as a standard by Watt. In spite of the great improvements in steam propulsion made in twenty-five years, the ratio of this effective power to a

ship's speed continued, and has continued ever since, to increase with every additional knot; thus the extra 4000 horse-power of the *Collingwood*, with two sets of engines driving twin screws, was required to raise her speed by about two knots above that of the single-screw *Warrior*.

The first steam-engines, driving paddle-wheels, were vertical. The crankshaft connecting the wheels running above the engines, from side to side of the ship (and spraying oil as it revolved), it was simple to couple them to it. With the screw propeller, as the shaft runs below the engine, and fore and aft, the engine had to be turned upside down or on its side. A screw needs to make many more revolutions per minute than a paddle, and to obtain these in early British screw warships the piston rod of the inverted or horizontal engine was coupled to the shaft by a system of cog-wheels, which wasted much power. Ericsson had contrived to couple the *Princeton*'s engine directly to the shaft, but this method was not adopted in our navy for another ten years. At once the screw's revolutions per minute went up from between twenty and thirty to fifty-four in the case of the *Warrior*, a figure that in another twenty years was to be doubled.

Until 1868 all screw-propelled British warships were single-screw vessels. Propeller blades were for long too big, and when a ship was under sail their drag reduced her speed. They were accordingly made detachable, being hauled up when necessary on metal guides between two stern-posts to an aperture in the counter. Funnels, if collapsible, were lowered when sail was made, and these quaint devices, operated by some such order as, 'Down funnel, up screw', gave comfort to the old school of naval officers, who considered steam power a dirty and unreliable nuisance and refused to believe that the era of hemp and canvas was passing.

A full sailing rig had to be retained with the early single propellers, which gave a good deal of trouble, while the engines of the time, because of the low pressure of steam in the boilers, ate up great quantities of fuel. Voyages to distant coaling stations had to be made under sail. This was still the case when twin-screws were introduced, first in our navy in the small ironclad *Penelope*. But though steam pressures increased by leaps and bounds, with consequent reduction of fuel consumption, and screws became efficient, traditionalism caused all navies to cling

to sails long after they were no longer needed as an auxiliary—after, in fact, the stage had been reached when it was heavy masts and spars that impeded speed. When, however, the French built their first cruisers in the 1870s they realized that to gain an extra knot or two hulls must be finer and sparring made lighter; but even in this class Britain continued to design hybrids in which it was attempted to combine high steam power with equally good sailing qualities.

2

When the first iron ships were built, not only was there a lot to be learnt about iron, but what had long been known about it was sometimes forgotten. No one seems to have given much thought to the early difficulties with copper sheathing. As soon as iron hulls were coppered, these troubles reappeared—the copper began to exfoliate, or come off in layers, losing its cleansing properties. Barnacles and marine growths gladly seized the opportunity, and once more fouling became a serious problem. In fresh-water ports these incrustations lose their hold, but during a long voyage, or a stay in tropical seas, an iron ship's bottom, it was said, soon looked 'like a lawyer's wig'. By the 1850s many merchantmen had their iron hulls below the waterline covered with wood, and could then safely be coppered: some were given wooden hulls hung on an iron framework. The *Inconstant* of 1866 was the first ship of the Royal Navy to have an under-sheathing of wood.

The French wooden ironclads were no better off. Where the copper sheathing met the armour galvanic action was set up, damaging the armour as well as the copper. Forty tons of barnacles are said to have been scraped from the bottom of the *Gloire*. The *Lord Clyde* and other wooden ironclads, the *Inconstant*'s contemporaries, were given a layer of so-called anti-fouling metal beneath the copper, but it failed, in the literal sense, to stop the rot. The *Inconstant*'s composite method of construction, a skin of wood over the iron, solved the problem, but added considerably to the cost of a ship, and copper being even more expensive, zinc was substituted. By 1870 the true remedy had been found—the first of the anti-fouling mixtures which can be applied to iron hulls like

paint; but early experiments were not wholly successful, and the navy carried on with composite sheathing for another fifteen years.

Iron hulls, in the meantime, had been giving trouble in another way, though through no fault of their own. In their early days they were exceedingly thin, and a main argument of the opponents of iron construction was that wooden hulls were impervious to blows that would pierce metal as if it were egg-shell. The answer to this was the double hull, the inner skin extending from the keel at least as high as the waterline. The *Warrior* had a partial double hull, with cellular divisions between the two skins amidships, and bulkheaded compartments above. But some of the first iron warships were single-hulled. Such a ship was H.M.S. *Megaera*, a vessel of 1500 tons launched in 1849 and rated as a second-class screw frigate; and it was the startling cause of her loss at sea that drew attention to another elementary fact about iron all but forgotten at some of our dockyards—namely, that it rusts.*

When the *Megaera* was seven years old an adverse report on the state of her hull was made at Woolwich, but the report was filed and forgotten, and in January 1871, she was commissioned from the Reserve to convey relief crews to the Australian station. No inquiries were made about her seaworthiness, and she sailed on the last day of the month with three hundred and forty-one officers and men on board.

She made the long voyage under canvas. Early in June, when crossing the South Indian Ocean from Simonstown to Sydney, she sprang a leak. It was thought to be due to the loss of a rivet, but attempts to stop the hole merely enlarged it, the truth being that her bottom was rusted through. Steam was raised, and with hand and bilge pumps working the *Megaera* was headed for the nearest land, a group of volcanic islets midway between Cape Town and Australia. On 19 June she was beached on the bar of St. Paul Island. Here her castaways lived for ten weeks before being rescued two days after the ship had broken up in a gale.

A court martial to inquire into the cause of her loss was held at Portsmouth in November and acquitted her captain, officers and men of all blame. The press, from *The Times* to *Punch*, gave

* Commander W. B. Rowbotham, R.N., 'The Loss of H.M.S. *Megaera* in 1871', R.U.S.I. Journal, Feb. 1955.

publicity to the court's proceedings, and the whole country learnt that a ship of the Royal Navy had been lost, and many lives endangered, in circumstances which, said a *Times* leader, 'convict the Admiralty of a parsimonious recklessness and of a cruel incompetence'. The Admiralty, as it happened, was then being reorganized, and the newly reconstituted Board was virtually put on trial before a Royal Commission, appointed to discover how a ship unfit to go to sea came to be sent to the other end of the world.

The Commission's report, distributing blame freely between the Controller of the Navy and the Admiralty secretariat, closed 'a sorry tale' by setting on foot reforms that were lasting. That the process began when constant advances in technical achievement made efficient management at the top a matter of great urgency, the navy owes to a blessing in disguise, the loss of the *Megaera.*

3

One of the most spectacular of these advances was made in the wrong direction, backwards, when in 1865, as has been noted, the Admiralty discarded heavy, breech-loading guns for built-up, rifled muzzle-loaders. Even the leading steam navies have always been in the rather odd position that the absolute essentials of their ships, the engines and guns, are the products of private enterprise. The Royal Navy's engines at this time came from firms like Maudslay and Laird and Humphreys, and its guns from Armstrong or Whitworth—or from Woolwich. Woolwich, indeed, is not a private enterprise, but it belongs to the army. It is controlled by the War Office. For a century and a half it had made smoothbores for the navy. Their trucks were a perquisite of its Carriage Department. As in the 1860s the Admiralty had no ordnance branch, nor even a gunnery staff, when it again placed orders with the Royal Arsenal it put the navy back into the hands of the army at a time when it was more important than ever before that the manufacture of naval ordnance should be under its own supervision and control.

The possibilities of the built-up muzzle-loader were obvious, but large calibres made no appeal to the soldier, except in the

limited sphere of fortress artillery. With ships it was very different. They now had machinery to cope with great masses of metal. Up to a point, big guns could be loaded by tackle which lowered the shot from the roof of the battery or turret, the method employed in Ericsson's monitors; after that, there was auxiliary steam power, and hydraulic power was on its way. With such mechanical aids, the Arsenal could now look forward to making bigger and bigger guns. The trouble was that there was no stopping this process, once it was started, and an additional inch or so in the calibre of a gun means a cumulative increase in its weight and in that of the projectile fired. Thus, in a few years that weight had risen from the hundred and twelve pounds of the first Woolwich rifle, the 7-inch M.L., to the seven hundred and twelve pounds of the 35-ton 12-inch. With the type of propelling powder then used, muzzle velocity remained low, but the 12-inch could pierce nearly sixteen inches of wrought-iron at the muzzle. One of the Admiralty's worries was that armour was now lagging dangerously behind the power of guns. As long as it was made of iron it would, of course, always lag behind, while with every inch added, its weight and its proportion to total displacement would increase. The nine hundred and fifty tons of the *Warrior*'s belt weighed less than one ninth of her displacement; ten years later the *Devastation*'s two thousand five hundred and forty tons of armour accounted for a quarter of her tonnage. Yet in theory her 35-ton guns would pierce her own plating at a thousand yards, then considered the longest range at which battles were likely to be fought.

On top of this problem the reversion to muzzle-loaders brought another. The elongated projectiles of rifled guns cannot be forced down the whole length of a grooved barrel. They were accordingly given rows of studs which fitted so loosely in the rifling that shot would pass fairly freely from the muzzle to the powder chamber in the breech. The method made loading slow, the studs weakened solid shot and often caused the casing of shells to break up before penetration, and the loose fit brought back the old plague of the smooth-bore, windage, and its resulting loss of accuracy. The long studded projectiles 'wobbled' in the barrel almost as badly as spherical shot. There were many complaints of this fault during target practice. After three ships had

fired twelve rounds from their rifled M.L.s at a rock off Vigo at a thousand yards, 'it was calculated that had they been directed at one of these ships there would have been only one direct and one indirect hit'*—and this was assuming that the ship, like the rock, was stationary.

An experiment made for a quite different purpose strikingly emphasized the failings of these weapons. In 1872 the new single-turreted coast defence ship *Glatton* and the turreted ram *Hotspur* were anchored two hundred yards apart in a quiet stretch of Portsmouth harbour. On a perfectly calm day, to test the armour of the *Glatton*'s turret, the *Hotspur*'s 12-inch, 25-ton rifled M.L., carefully trained, fired three shots at it. The first shot missed the turret altogether; the second hit; the third virtually missed, being too low, but striking the glacis of the turret's breastwork it glanced up, pierced the turret's armour but not the backing, and broke in pieces. If in the best conditions the navy's heavy guns were so unreliable at two hundred yards, it was argued that ships carrying only one or two, or at the most four, were inferior as fighting machines to vessels mounting more numerous smaller guns in broadside batteries. The real lesson of this test, that what was wrong was not the type of ship, but the type of gun, was not yet grasped by the Admiralty—or was not admitted.

4

In any case, as long as the navy was tied to Woolwich, it was committed to muzzle-loaders. The Arsenal had not then the equipment or the experience to compete with private armament makers in the construction of powerful breech-loaders. The defect of the early breech mechanisms, the possibility of firing the gun with the breech imperfectly closed, had been remedied by a French invention, the interrupted screw, which automatically locks the breech-block; the Armstrong and Whitworth firms were going ahead with improved types of this gun, which were much in demand abroad, while by the time the first Woolwich 35-ton guns were delivered to the navy in 1873, at the Armstrong works at Elswick, experiments had begun which in themselves spelt the end of the muzzle-loader.

* Oscar Parkes, *British Battleships, 1860–1950.*

The powder then in use for charges was quick-burning. Elswick was experimenting with slow-burning powder, which expends much less energy in the initial explosion and so produces higher muzzle velocities. To obtain its full effect, the slower process of combustion requires a gun with a long bore. As the massive bottle-shaped muzzle-loaders got bigger, the length of the chase was restricted by loading problems. When slow-burning charges came to be tried in them, its large grains were not wholly consumed before the shot left the muzzle; power was thus wasted, and captains of turret-ships were greatly annoyed by burning grains flying about and scarring their decks. Breech-loaders were longer guns, and being unaffected by loading problems their length could be increased to ensure the complete combustion of a slow-burning charge. Thus while the navy's first rifled M.L., the 7-inch 112-pr., of 1865, was ten and a half feet long, its first Armstrong breech-loader using slow-burning powder, a 6-inch 100-pr. adopted in 1880, was four feet longer, and it had a muzzle velocity higher by a fifth than that obtained with any muzzle-loader. This added superior power of penetration to the breech-loader's other advantages of relative lightness, long range, accuracy, and speed of loading. The automatic locking of the breech-block had rendered it almost fool-proof. This the muzzle-loader never was, and a disastrous accident was soon to show that with new methods of mounting it was subject to new forms of human error.

The perfection of slow-burning powders was still in the future when, with the 35-ton 'Woolwich Infant', the Admiralty would willingly have called a halt to the growth of big guns. If it would not admit its mistake in turning back the clock, there were by now clear indications that in the competition between guns and armour, wrought-iron would always lose. Tests were being made with compound armour, a combination of iron and steel, and, in France, with steel plating. Again it was a time to wait and see. But, in fact, even a pause was out of the question. A product of the age of machinery, the armament race was now well under way, and there was no stopping it.

The French navy had remained faithful to breech-loaders. It was now getting them of French make, up to guns of 10·8-inch calibre, and a 17-inch (42-cm.) monster was in the design stage.

Because of British interests in the Mediterranean, the Italian navy had also to be watched, and having been in the doldrums since Lissa, it had begun an ambitious revival with two remarkable ships laid down in 1872. With an eye to the future, the *Duilio* and *Dandolo* were so designed that they could be adapted to carry far bigger guns than those originally allotted them—38-ton Armstrong rifled muzzle-loaders. These were a big advance on the Woolwich 35-tonner; and they introduced a further complication, the influence of private enterprise on the armament race.

Neither the Elswick firm nor Whitworths had neglected muzzle-loaders; in 1871 both threw out the announcement that they could make bigger rifled guns of this type than any yet put on a ship. Armstrongs being as good as their word, the Admiralty had no choice but to call on Woolwich to match these 38-ton guns. In the meantime it by-passed the Arsenal by ordering two from Elswick. Eventually put in the forward turret of the *Devastation*'s sister ship *Thunderer*, they were the first guns in our navy to have the Armstrong hydraulic loading gear.

In the ensuing and final developments of the rifled muzzle-loader there is a sort of elephantine absurdity. Having accepted the Admiralty's order for 38-ton guns, Armstrongs blandly offered the Italians 15-inch, 50-ton guns for their new ships. The offer being welcomed, again the Arsenal had to go one better. It designed a 60-ton gun. This was never in production; on second thoughts, in the spirit of those bidders at auction sales who to shake off competitors make startling jumps in their bids, the Admiralty cancelled the order, substituting one for 80-ton guns. A ship just laid down, the *Inflexible*, designed for the 60-tonners, could be altered to take what the Board hopefully believed would be the last word in naval ordnance.

It was to be the more deceived. By 1876, when the *Inflexible*'s new guns were ready for delivery, Armstrongs had dispatched four 100-ton guns for the adaptable *Duilio* and *Dandolo*. Faint but pursuing, Woolwich made one too, but not for service at sea. In this phase of the armament race the Admiralty admitted itself beaten. In any case, the clock was about to be put on again. When the last and largest of the Arsenal's 'Infants' was proved in 1879, the navy had done with muzzle-loaders—though not yet, unfortunately, with dependence upon the Arsenal itself and

the War Office. As the experience of private enterprise in making breech-loaders would have to be invoked, it was perhaps as a placatory gesture that in this year four Armstrong 100-ton M.L.s were ordered for coastal defence. Two were sent to Malta, and two to Gibraltar. To soothe Woolwich, a pair of its 80-tonners were mounted in a turret on the Admiralty pier at Dover, and they are *in situ* today.

The Admiralty's decision to return to breech-loaders was inevitable, but it was perhaps hastened by growing disillusion with the Arsenal's methods. This began at an early stage of the rifled muzzle-loader's development, when the Royal Carriage Department proved incapable of keeping up with the rapid growth of guns. The first Woolwich 6½-ton gun was mounted on a truck carriage of the old type, made of iron instead of wood, but the bigger guns that followed could not be put on carriages. They required an entirely different form of mounting, that would take their weight and the shock of their recoil, and the Carriage Department could not design a satisfactory one. From the 10-ton gun upwards, the mountings were designed either by naval officers or by one of the private armament firms, in particular by Armstrongs, whose hydraulic buffers and loading system were a notable contribution to naval gunnery.

But there were worse faults at Woolwich. It reflected the state of the army, still living in the days of the Crimean War. Reforms at the War Office were at hand, but before they came about, dissatisfaction with the Arsenal's products had become rife in the navy and outside it. And the outsiders were important persons—eminent Fellows of the Royal Society like Sir Henry Bessemer, some of them members of the now influential Institution of Naval Architects. To these scientists and engineers the situation seemed so grave that they took an unprecedented step; they drew up a petition on the state of affairs at Woolwich which in 1880 they presented to the House of Commons. It expressed their dismay at the defects of British heavy guns, due to the Arsenal's inefficient and dangerous system of making ordnance, and at the false information and wrong principles officially disseminated and taught in both services. So far as the navy was concerned, in one sense the petition came a little late, for by 1880 the Admiralty had abandoned Woolwich, but this was only for the time being,

and the public exposure, besides shaking up the military, strengthened the Board's hands in the future.

In the meantime, the Board had taken steps of its own. An Ordnance Department was created at Whitehall. By a happy selection, in 1886, when Woolwich was learning to make big breech-loaders, Captain J. A. Fisher was appointed Director of Naval Ordnance.

CHAPTER SIXTEEN

The Years of Experiment: II

1

As long as steam power was subordinate to sail its use in warfare was all but limited to actual fighting. Only when fleets sighted one another would they furl sails, raise funnels and lower screws. This, at least, was how the British and French navies, based on ports in some cases many hundreds of miles apart, must have envisaged hostilities between their early ironclad squadrons. Hostilities of this kind, however, never occurred; the only full-scale naval war in the age of experiment took place in the Adriatic, where distances are so short that the opposing fleets were able to cruise under steam. In these narrow waters the wartime rig of the newest Austrian ironclads dispensed with sails altogether.

Once in contact, opposing fleets with auxiliary steam power would enjoy the freedom of manoeuvre, regardless of wind and currents, that their engines bestowed on them; but the first sea-going ironclads being broadside ships, before the Battle of Lissa it was assumed that fleet actions would still be fought more or less in the old way—the tactical formation would be line ahead, the two fleets steaming on parallel or opposite courses a thousand yards or less apart. Freedom of manoeuvre would be employed according to circumstances—to break the enemy's line, to reach ahead of it and cross the 'T', to concentrate on a part of it or on disabled ships. If a mêlée resulted, commanders would be anxious to resume fleet or divisional formation as soon as possible. In the new conditions isolated ships were in greater danger than in the leisurely and uncertain days of sail, while, as in those days, early steam ironclads were formidable only as long as they could keep their broadsides to the enemy. Their fore-and-aft fire was limited to one or two chase guns, and even with a complete belt of armour they were still most vulnerable to a raking fire.

The naval side of the American Civil War, for all its influence upon the future of ironclad design, threw no light upon the

conduct of a fleet action. The operations in the Adriatic in 1866 were accordingly followed with intense interest by every naval service. In the event, however, the Battle of Lissa merely darkened counsel. Everything that happened was unexpected. The stronger fleet was badly beaten by the weaker fleet, and orthodoxy by unorthodoxy. In conditions revolutionized since Trafalgar, Admiral Tegetthoff's tactical plan was that of Nelson in 1805. Having led his ships against a line of broadsides in a formation which restricted reply to a few rounds from bow-chasers, he deliberately brought about a mêlée. At Trafalgar, at the same stage, the British were able to make use of what little wind there was to concentrate on the enemy's weathermost ships while those to leeward struggled into action; but sixty years later steam power deprived the Austrian fleet of this opportunity. Every ship in the Italian line could take part in the mêlée from the start. It was for this reason that Tegetthoff, inferior in ironclads, supported them with his wooden unarmoured division. In his form of attack he may have counted on the moral effect of the swift onset, at nine knots, of his armoured arrowhead. He must have known that his well-trained fleet was superior in everything but numbers to that of Persano, which, in fact, after this menacing advance, never recovered from the confusion into which it was then thrown.

That this simple truth was the real lesson of Lissa was not, however, generally understood at the time. Naval thought, seeking reasons for the defeat of eleven ironclads by seven less powerful ones, fastened first upon the use of the ram. A tactical expedient adopted to counter the enemy's superiority in fire power, Tegetthoff's order to his ships made an exaggerated impression. The method he employed to enforce a mêlée, which flew in the face of naval doctrine of his day, did, however, lend support to a conclusion drawn from the universal conversion to the ram as a major offensive weapon—ships' batteries must be rearranged to provide more powerful end-on fire.

After 1866 there was not to be another fleet action between ironclads for nearly thirty years. A number of naval engagements were to take place—literally from China to Peru—in which a few armoured ships were involved, but from these little wars no new lessons emerged that were applicable to the conduct and tactics of large armoured fleets; and in Europe, in the meantime, while

warship development went ahead at a constantly increasing tempo, old beliefs were dying hard. Among them was the legend of Lissa itself. It led to the building for the British navy, twenty years afterwards, of two of the most ill-balanced battleships ever designed, everything else in them being subordinated to tremendous forward fire power and the ram. By a tragic stroke of irony, one of them was to perish by the ram in time of peace, and only a year before some much-needed light was cast upon transformed conditions of warfare at sea by the Battle of the Yalu. Even then, in these conditions, the influence of the legend was still active. Tactics that could successfully be employed in 1866 were attempted in utterly different circumstances in 1894. Against the line ahead of the faster and better trained Japanese fleet, bristling with quick-firers, the Chinese admiral advanced in line abreast.

In one respect, in 1894 every navy in the world was still living in 1866. A cautionary incident at Lissa, the loss of the *Palestro*, attracted little attention. A few naval officers pointed the moral, but their warnings went unheeded. Internally a mass of woodwork, like all iron and ironclad ships of her time, the *Palestro* was destroyed by fires started by a bursting shell. Though for technical reasons the proportion of metal in internal construction steadily increased, timber decks, cabins and furniture, and much varnish and paint, continued to render warships dangerously inflammable until the Battle of the Yalu, when a dozen ships were set ablaze by shell-fire, drove home the necessity of eliminating woodwork.

2

The limitation of practical guidance to one early and misleading fleet action left open a wide field for theory and experiment in subsequent ironclad design. Diversity of type was a feature of almost all navies for twenty years after Lissa. The growth of the British navy was notably haphazard, because in addition to perplexities that were common ground, it suffered more than most from lack of continuity of overhead policy. The three Chief Constructors, who in turn were responsible for design during this period—the third had his title changed in 1875 to Director of Naval Construction—happened to be men with widely different ideas, while in the case of the last two their responsibility was

sometimes only nominal. They were subject to interference from above and pressures from outside.

Isaac Watts, in whose time the *Warrior* and ten more ironclads were laid down, did little more than add a belt of armour to a conventional type of ship intended for conventional broadside tactics. Attack being the traditional role of the British navy, this newfangled form of protection was less important than guns. It was under Watts's successor that experiment and inventiveness really got going, coupled, as some thought, with a heretical attitude towards tradition. Sir Edward Reed was accused of making offence secondary to defence, putting armour before guns. If he appeared to do so, it was because he believed fervently that the ram, not the gun, was to be the primary weapon of the battleship of the future. To enable her to survive to employ the ram, she must be heavily protected, by transverse as well as by side armour.

It is as an experimenter on these lines that Reed made his mark. When he retired in 1870, after only seven years as Chief Constructor, he left an ironclad fleet that has been described as a collection of samples.*

He had found a nucleus of very similar ships, all rigged for sail, and all having their guns spaced out along the whole length of the main deck. The interest of his early designs lies in his methods of providing the end-on fire combined with athwartship protection that was the necessary complement to reliance on the ram. These ships had bow and stern guns and a central armoured citadel with recessed or indented ports to give further fire ahead or astern. The defects of the type were inherent in vessels hampered by a sailing rig. As the bow guns were on the main deck they were so near the water that their ports could not be opened in a head sea, and in some ships the wave raised by the ram in calm weather flooded through them. The guns could not be put on the upper deck because the bowsprit would then mask them. The bulk of naval opinion being so firmly wedded to sails, it was only at the very end of Reed's term of office that he was able to break completely with orthodoxy in the battleship class by sweeping away the spars and cordage that were the impediments to the obvious recipe for powerful fire ahead—the turret.

* Oscar Parkes, *British Battleships, 1860–1950.*

In the meantime, however, the clamour for coast or harbour defence ships gave him the opportunity to experiment with the mastless turreted ironclad on a small scale. His first 'breastwork monitors' were double-turreted ships of round about 3000 tons. A central superstructure, with an overhang that made it resemble a clumsy occasional table, rose between the turrets. Funnel and ventilators were led through it, and it had a pole mast for signalling. The hulls of these vessels conformed to the monitor type, having a freeboard of only three or four feet. The novel features of Reed's designs were the high superstructure, providing a dry shelter-deck from which the ship could be navigated, and the so-called 'breastwork'. An armoured oval within the hull's end-to-end belt, enclosing engines, magazines and the bases of the turrets and superstructure, this lifted guns and hatchways well above the deck of the hull, clear of waves washing over the low hull itself.

Of the first three 'breastwork monitors', one went to Melbourne and two to Bombay, disproving the belief held by most senior naval officers that these low freeboard monstrosities were unfit to keep the sea. They were followed by the larger but very similar *Glatton*, designed for home service and armed with two 25-ton, rifled M.L.s in a single turret. She was the most strongly protected ship of her day, armour accounting for twenty-five per cent of her displacement. Her requirements and dimensions were laid down by the Admiralty, and Reed said he never knew what her function was supposed to be. She had a prominent ram and relatively deep draught, but she could not have kept up with a fleet, and virtually the whole of her thirty years' life was passed in Portsmouth harbour.

Equally typical of the confused ideas of this period were two more of Reed's 'samples', specifically classed as rams. Such was their designer's faith in this weapon that the *Hotspur*'s turret was fixed, as Reed feared that the shock of ramming might jam a revolving turret. As sea-going warships, which the pair were intended to be, they were, like the *Glatton*, too slow to keep up with a battle fleet. In design, however, they and the monitors, all embodying the raised breastwork, were a radical departure from the conventional ironclad of the time. They pointed towards the type of capital ship to come. 'Between the harbour defence ship

and the sea-going battleship', it has been said, with particular reference to one of Reed's monitors, 'the difference was merely a matter of degree—the *Devastation* was to develop out of the *Cerberus* in due course.'*

3

The *Devastation* and her sister ship *Thunderer* were in fact laid down before the *Cerberus* was completed. This was in 1868, a new First Lord having been appointed who was in sympathy with Reed's views about turret-ships. The design of this pair was considerably modified and improved by Reed's successor, Nathanial Barnaby, but essentially they were Reed's conception. They were his breastwork monitors given the size, power and sea-going qualities of a battleship.

The *Devastation* was commissioned, several years ahead of the *Thunderer*, in the spring of 1873. In the revolutionary features of her design she was a more remarkable ship than the famous *Dreadnought* of 1906, which was the product of a quarter of a century's evolution. She and her two sisters (the third of the class was an earlier *Dreadnought*) have been described as the only true ironclads, having overall armour 'impervious to any gun except the largest at close range'. A more picturesque contemporary called the *Devastation* 'an impregnable piece of Vauban fortification with bastions mounted upon a fighting coal mine'.† A much larger edition of the breastwork monitors, her 9330 tons giving her nearly three times their displacement, she carried four 35-ton, rifled M.L.s in two turrets forward and aft. Between them rose a superstructure with an overhang, topped by two funnels and a pole mast. Her armour made up twenty-seven per cent of her tonnage. She had a prominent ram, and her sides were specially constructed to resist ramming, and with her class began the system of dividing the hold into a large number of watertight compartments. The average fuel capacity of a battleship of the time was about six hundred tons; the *Devastation* had bunkerage for eighteen hundred. With her turrets where turrets should be, her four guns together virtually had an all-round fire. She presented

* Oscar Parkes, *British Battleships, 1860–1950.*
† Thomas Brassey (1st Earl), *The British Navy*, Vol. 1 (1882).

little to aim at, and even in a sea proved to be a remarkably stable gun platform. Her simple three-piece layout was to be the pattern of the battleship of the future. A word overworked today, 'functional', would correctly have described her.

Predominant British naval opinion, however, was violently prejudiced, and it used stronger words. Any radical innovation was automatically suspect, and here, foisted upon the battlefleet, was something entirely new, from her keel to the truck of her miserable pole mast. To most senior officers, a sea-going ship without a rag of sail was anathema, and a more general objection to a low freeboard in this class had been strengthened by the recent loss of the *Captain.* Not for the first or last time, aversion to novelty clouded judgement. Compound engines, twin screws, and an enormous fuel capacity for her day freed the *Devastation* from servitude to sail, while her hostile critics, as Barnaby pointed out, failed to distinguish between two very different uses of freeboard. All that the loss of the *Captain* proved was that a high side is required in a sailing ship; her very similar contemporary, the *Monarch*, with her modest fourteen feet of freeboard and lighter sparring, was perfectly safe. In a mastless ship a high freeboard is an unnecessary evil, setting up quick and deep rolling. Though when their forecastles were awash in a seaway the *Devastation* and *Thunderer* looked like half-tide rocks, they proved thoroughly seaworthy. But by their critics they were long considered unsafe as well as hideous.

4

The *Glatton* was not the first ship designed by Reed upon orders from the Admiralty. Two months before her keel was laid at Chatham in the summer of 1868, a sea-going turret-ship of twice her displacement was launched at the same yard. A second ship of the same type was then under construction on the Mersey. The Chief Constructor's lack of enthusiasm for these powerful additions to the fleet, for the first of which he was nominally responsible, was shared by the Board of Admiralty, but once again the latter had been forced to bow to public opinion.

The story of the *Monarch* and the *Captain* forms a strange chapter in the annals of British naval administration. The two

Warriors were built because the reduction by three-fourths of the crippling stamp duty on newspapers had given popular feeling an outlet and a voice. In the year when the *Warrior* herself was completed the last penny of the duty was abolished. It was at once taken off the price of the most influential journals, and the new power in the land could exert its full strength. Technical achievements transforming the naval scene, embodied in the iron-clad, were news with a capital 'N', and a cheap press kept the public constantly alive to real or fancied threats to Britain's supremacy at sea. Not only Members of Parliament, but all who had the state of the navy at heart, or pretended that they had, could make themselves heard throughout the country. The Admiralty found itself the butt of continual hostile criticism, much of it ill-informed and undeserved, for the Board, once converted, was doing its best.

In the forefront of the attack was Captain Coles, fanatically preaching the gospel of the turret. From coast defence ships and little vessels like the *Rolf Krake* and the *Huascar* his ideas had soared, and as early as 1862 he was lecturing at the Royal United Service Institution on a design for a sea-going turret-ship rigged for sail and fit for the line of battle. An unlikely product of the Silent Service, Coles fully understood the uses of publicity; he rained letters on the daily press, he wrote articles, he addressed meetings. Besides his following in Parliament, he won the backing of the leading newspapers. The middle 1860s were noisy with the growing clamour for turret-ships.

A body of opinion in the service, and at least one important member of the Board of Admiralty, shared Coles's views. He was lent assistance from the Chief Constructor's office to provide the technical knowledge he lacked, and his design, thus completed, came before the Board early in 1863, a few months before Reed was appointed Chief Constructor. The design being rejected, Coles returned to the charge, was again given technical help, and, in April 1865, submitted a second design for a smaller turret-ship. On the advice of Reed and the Controller this was also turned down.

No one had greater faith in the turret than Reed, but he was more far-seeing than the advocates of turrets for turrets' sake. The day of the turreted capital ship had not yet come. The

property of all-round fire would be wasted on ships rigged for sail, and the very idea of a big mastless sea-going ship was then regarded as visionary by all but a few. Reed was content to wait until he had prepared the way towards his real aim with his breastwork monitors. In judging Coles's design, the Chief Constructor merely registered his disapproval of putting turrets on sailing ships; his main objections, apparently shared by all the naval members of the Board, were raised on other grounds. The most weighty concerned the question of stability; the design combined a low freeboard with three heavy iron tripod masts and a full sailing rig, and upon these features Coles insisted. Such a ship, in Reed's opinion, would be dangerously top-heavy.

Though rejecting the design, the Board felt that in the state of public feeling something should be done, and a committee was formed to consider the whole matter of turret-ships. The committee recommended that a trial should be given to a sea-going vessel of this type; and the Chief Constructor's office—this was the way Reed put it—having prepared its own design, the *Monarch* was ordered to be built at Chatham. Her keel was laid in June 1866.

She was a three-masted, fully rigged ironclad of 8300 tons. An armoured citadel amidships protected the bases of two turrets on the line of the keel forward and aft of the funnel. Each was to be armed with a pair of the new Woolwich 25-ton, rifled M.L.s. A flying deck ran above the turrets. The ship had a freeboard of fourteen feet, a short forecastle and a pointed ram, and with her exceptionally fine lines she was to be the fastest battleship of her day. She was the first to carry 12-inch guns, but being amidships, though all four could be trained on either beam, masts and shrouds virtually deprived them of axial fire. Two 7-inch guns behind armour in the forecastle were all that the *Monarch* could bring to bear ahead.

In ordering her, after rejecting Coles's design, the Admiralty must have expected trouble, but it was clearly taken aback by the storm that followed. Coles's ill-health at this time may have aggravated a growing tendency to regard all who even questioned his ideas as mere obstructionists. He seems to have taken the Admiralty's decision to build the *Monarch* as an affront and an insult to the man of the hour. He could see no good in her, and

his complaints and criticisms whipped up feeling in the press, and among members of both political parties in Parliament, until the Board was under violent censure from all quarters for daring to build such a ship in disregard of his views. Most unfortunately, Coles's supporter on the Board itself, though not even a seaman, was an influential personage; he was First Lord, and a duke. Intimidated, in plain words, by this combination of forces, the naval members were persuaded to adopt an extraordinary course of action. At a cost of nearly £340,000 of public money, the navy was saddled with a ship for which its own governing body would take no responsibility whatever.

Seven months after the *Monarch* was laid down, work began on the *Captain* at Laird's Birkenhead yard. She was designed strictly according to Coles's ideas, carried out by the firm's experienced staff. Coles himself was too ill to exercise supervision on the spot. Like the *Monarch*, though a smaller ship, the *Captain* was to carry four 25-ton guns in two turrets amidships. Her freeboard was to be eight feet six inches, as against the *Monarch*'s fourteen feet; her three masts, the lower masts being iron tripods, were the tallest and heaviest in the fleet, and with a full sailing rig would spread thirty-seven thousand square feet of canvas to the *Monarch*'s twenty-seven thousand. A forecastle and poop, from which the ship was worked, were joined by a light deck above the turrets. These were further apart than the *Monarch*'s and had a better axial fire. The *Captain* was the second British capital ship, and the first of her size, to have twin screws.

During her construction the Admiralty refused requests to appoint a supervisor, as was customary with ships built at private yards. It would have no hand or part in the business. Reed's department checked the quality of the material put into the *Captain*, but having passed it, in a petty spirit would not use the word 'approved'; nor would it check the weights, though experience had shown how often these were underestimated, especially in contract work. And it was here that dangerous errors crept in and accumulated. In the end the turrets had exceeded their specified weight by twenty-five tons, guns and mountings by twenty tons, engines by seventy and armour and backing by ninety. Altogether, the ship was heavier by eight hundred and sixty tons than she should have been; her displacement rose by as much,

her draught increased by two feet, and in consequence her already low freeboard was fatally reduced—from eight feet six inches to six feet six inches. Lairds felt some doubts about her stability, and after she was floated tests were made, but though it was calculated that her safe angle of heel was only twenty-one degrees, low freeboard ships were not expected to roll heavily, and it was assumed that all was well.*

The *Captain* was completed in January 1870. After commissioning she joined the Channel Squadron, and behaved excellently in a gale. Opinion at the Admiralty veered in her favour; only Reed remained unconvinced of her seaworthiness. A chorus of praise rose from her admirers, to whom Coles was more of a hero than ever.

And then, in a night, the chorus was stilled. In August the *Captain* was again at sea with the Channel Squadron, on a cruise to Gibraltar. Coles was on board her. Homeward bound, on the evening of 6 September the squadron was off Finistère. The ships had steam up, but were under sail. This was reduced as the wind blew harder, and steam was raised. At nightfall the *Captain* still had her topsails set, double reefed. Soon after midnight what has been described as a moderate squall struck the squadron, which became somewhat scattered. When at daybreak it drew together, one ship was missing. Laid over by the squall, under the weight of her heavy masts and the pressure on her topsails, the *Captain* had capsized. All her officers, Coles himself, and all but eighteen of her crew of four hundred and seventy had gone down with her.

5

Ironclad development in other navies was a matter of keen professional interest to the Admiralty and its Chief Constructors. In the case of the French navy there was a double preoccupation, since it was our only rival numerically.

The methodical instincts of the French, and a consistent policy directed by Dupuy de Lôme, set bounds to the impulse to experiment. Their capital ships of this decade, unlike our collection of samples, were built in homogeneous classes, sometimes numerous;

* Oscar Parkes, *British Battleships, 1860–1950.*

thus four Gloires were followed by ten more, of improved design, and the *Alma* of 1865 was the first of eight very similar ships. With the power of ordnance increasing almost yearly, this tidy system had, however, the disadvantage that a new gun could render a whole class obsolete. Before any of the improved Gloires were ready for sea, their armour was outmatched by the latest breech-loaders.

French capital ships at this time were vessels of from 6000 to 8000 tons, displacements to which we had reverted after the Warriors and the still bigger Agincourt class. All were, of course, rigged for sail. Faith in the wooden hull, though the weight of armour strained timber frames and tended to distort them, lingered into the 1870s, but with the Almas a composite form of construction came in; only the underwater hull was of wood, iron being used for the unarmoured upper works. Sharing the general belief in the ram, in the high-sided ships he designed, Dupuy de Lôme dispensed with turrets, but he adopted the revolving gun platform to provide the end-on fire which Reed obtained by means of indented ports. In the Almas and later classes a fully armoured citadel amidships, following Reed's designs and enclosing secondary main-deck guns, was carried up at the angles in the form of towers sponsoned out from the ship's side at upper-deck level. In each sponson a heavy gun was mounted *en barbette*, a quaint borrowing from the dressmaker's art, the diminutive of 'beard' having come to mean linen or other material rising high at the throat above the dress—e.g., the Englishman's 'choker'. The ship's barbette was a circular or pear-shaped armoured bulwark within which the gun revolved on a turn-table. The gun was exposed, but, being a breech-loader, its crew was protected when the breech was depressed for loading. In the firing position a wide view was obtained for aiming, as opposed to the very limited view from a turret, while the projection of the sponson, and a slight tumble-home of the ship's side, gave the gun a clear field of fire ahead or astern.

The Almas had two of these towers, at the forward angles of the citadel, just abaft the shrouds of the foremast. The next class had towers at all four angles. Later variations of this system were attempts to get round the fundamental difficulty of combining end-on fire with a sailing rig; as guns grew more powerful, but

still had to be mounted clear of masts and shrouds, whether they fired through recessed ports, as in our ships, or from higher projecting sponsons, if they were trained parallel to the vessel's side the effect of blast was troublesome and even damaging. Some years after we had been converted to the low freeboard battleship, however, with its heavy guns in pairs forward and aft, their arc of training unimpeded, the French were still building tall-sided capital ships, whose big guns were perched singly in barbettes in a lozenge formation high above the water. A curious result of the borrowing of ideas by one navy from the other was that when the French eventually adopted the turret we had abandoned it for the barbette.

The revival of Italian sea power being yet to come, besides that of France only the Russian navy caused the Admiralty serious concern. The replacement of the ships sunk at Sevastopol made slow progress, since armoured units had to be built at St. Petersburg and then taken to pieces for conveyance a thousand miles by railway to the Black Sea—in itself a notable feat; but by 1870 a considerable ironclad fleet was afloat or under construction in the Baltic. The largest of a number of sea-going turret-ships, the 3700-ton *Admiral Lazareff*, carried six 15½-ton guns in three turrets, heavy metal for her size. The armoured cruiser *General-Admiral* had a protective deck, and may have inspired the *Shannon*, our first ship with this feature. Two very queer vessels reassembled on the Black Sea were known as *Popoffkas*, after Admiral Popoff; they were completely circular, with six screws and almost flat bottoms. Their pairs of 28-ton breech-loaders were mounted on a central turn-table. Reed thought well of them, and an Imperial yacht, with a modified form of the flat circular hull, was built in a British yard, and this skimming-dish proved a fair sea boat; but though there was talk of a 12,000-ton ironclad 'turbot', the 'Popoffkas' remain unique among the many oddities of these experimental years.

The Russians, however, were the first to appreciate the merits of the *Devastation*'s three-piece layout, completing in 1875 two ships of her type carrying four 12-inch guns in their turrets. In the meantime, Italian designers and engineers launched their navy's revival with the *Duilio* and *Dandolo* already referred to. Also mastless, they combined modest dimensions with high speed

and very heavy armament and protection, but their design denied them full use of their independence of sail; armour that would defeat 15-inch guns had to be limited to a central citadel, above which their own immense 17-inch, 100-ton muzzle-loaders were mounted in pairs in turrets arranged diagonally. The effect of blast on funnel-casings and other obstructions restricted anything like end-on fire to the two outer guns. The armour was steel, bought in France, and, at a time when British ships were still armoured with wrought-iron, had been made into plating by a British firm. These two ships were followed a few years later by a pair even more remarkable, the *Italia* and *Lepanto*. Vessels of 15,000 tons, with a speed of nearly eighteen knots, they had a protective deck but virtually no side armour; heavily armoured barbettes again placed diagonally, high above the water between two groups of three funnels, carried four Armstrong 103-ton breech-loaders, and there was a secondary battery of 6-inch guns. But these ships, which were a reply to our *Inflexible*, shared with her and their predecessors the radical defect of having their big guns amidships, deprived of genuine all-round fire.

The very new Imperial German navy was to remain insignificant until a book by an American naval officer inspired the Emperor William II with the belief that Germany's future lay on the water; its few ships were designed to defend the country's very short coastline on the North Sea, consisting of three river estuaries sheltered by sand banks. In the Franco-Prussian War of 1870–1, these obstacles, and mines in the channels, baffled the powerful French fleet with its deep-draught battleships. A disastrous military defeat had, however, left this fleet intact, and France's great resources enabled her to begin a new naval programme in 1872, when the 9200-ton *Redoubtable* was laid down, the first big ship built internally of steel. Timber construction was now altogether abandoned. In 1876, with the Amiral Duperré class, the central citadel disappeared, a very heavy main armament in the usual barbettes on the upper deck being combined with a numerous main-deck battery of relatively light guns; and before 1880 the design of the four Caimans linked the British Devastations with the *Collingwood*, laid down in that eventful year. Heavily armoured amidships, with two tripod masts carrying what were then called military tops, and a pair of 16½-inch guns on barbettes

forward and aft of a low central superstructure, these four were battleships thinly disguised as coast defence vessels.

Only a few years after the small Austrian navy, by its tactics at Lissa, had influenced battleship design, it sponsored an invention that was to have a profound effect, progressive from that day to this, on warfare at sea. By 1866 an English engineer at Fiume, developing the ideas of an Austrian naval officer, had perfected the fish torpedo—the first that propelled itself under water at any required depth. Most navies had adopted the Whitehead torpedo by 1875, and naval architects henceforward had to take into account an entirely new weapon of immense potentialities.

CHAPTER SEVENTEEN

Towards a Pattern

1

In Whitehall, during the 1870s, the game of 'pull-devil, pull-baker' between different schools of thought, and the versatility of Nathanial Barnaby (whose title was changed to Director of Naval Construction in 1875), led to a multiplication of warship design exceeding even that of Reed's time. Throughout, however, Barnaby was feeling his way in the right direction, and he must be given the major share of credit for the production in the end of a stable type of battleship—the simple three-piece layout derived from Reed's monitors and the *Devastation*—from which, in all navies, the class was to develop.

Problems of design, and the service war which raged over them, were thrust into prominence by a Special Committee appointed by the Admiralty in 1870 to inquire into the loss of the *Captain*. The navy's dismal forebodings about the three Devastations, the *Dreadnought* (originally *Fury*) having by now been laid down, caused work on this ship to be suspended. Some of the Committee's recommendations were adopted, but when, with regret and reluctance, it advocated the abandonment of sails on future first-class capital ships, the proposal seemed almost blasphemous folly to an influential minority of its members, and as this represented the large body of service opinion which regarded the *Devastation* with horror and shame, the Admiralty gladly left so controversial a matter in the air.

The cruising range of the Devastations was not to be equalled in any class for some time to come, but the opposition to a mastless sea-going ship was based more on sentiment and ignorance than on reasoning. At this period few officers in the British navy knew anything about naval architecture or engineering, regarded as sciences. The steam-engine was an unfortunate necessity, best left to those who understood it, and a dirty and oily engine-room being scarcely the place for gentlemen, the engineering staff was

socially inferior to the executive and fighting branches. How wide was the gulf between these branches and the naval architect in elementary knowledge of warship construction is illustrated by Barnaby's complaint that able and experienced seamen failed to understand the principles governing a ship's freeboard. An instructional body was in existence, but the Institution of Naval Architects was still too young to have gained the influence it was later to exert in helping the navy to educate itself.

In these confused conditions work on the *Dreadnought* was not resumed until 1872. Largely redesigned, she was bigger and even more heavily armoured than the first pair. She was the first ship to have a longitudinal bulkhead amidships and artificial ventilation. Her two pairs of Armstrong 38-ton, rifled M.L.s were longer than the Woolwich 35-tonners, and, like the pair already mounted in the *Thunderer*'s forward turret, were loaded externally, the muzzles being depressed to meet loading-tubes slanted up through the deck outside the turret wall. The hydraulic loading system reduced a gun's crew to four, and the number of men in the turret to ten, instead of the twenty-two required for the Woolwich guns. The *Dreadnought*'s pole mast had a military or fighting top for machine-guns, and when the navy had become reconciled to battleships without sails it was admitted that she was a successful ship, her freeboard of twelve feet and flush deck making her better in a head sea than her low-freeboard sisters.

She was not completed, however, until 1879, and her British contemporaries under construction, taking in several below the battleship class, reflect almost every shift of opinion of the time, and include some very strange whims.

Only a handful are of interest now. Barnaby was perhaps too fond of copying foreign models, and the *Alexandra* was his version of the Austrian *Custozza*. Packed into her two-decked citadel were no fewer than twelve 11- and 10-inch guns. Forward fire was obtained from four deeply indented ports, two a side, disposed one above the other in steps. In a sea, waves piled up on the steps, blanketing the guns and checking speed. For the *Téméraire*, Barnaby sought inspiration from the French, and produced our only rigged high-freeboard barbette ship. To give the barbette guns a wide axial fire, they were placed well forward and aft, an arrangement entailing a brig rig, and the *Téméraire*'s sail area was

the largest ever carried by a two-masted vessel. This pair were among the last desperate expedients to combine large-calibre end-on fire with a sailing rig.

Barnaby's versatility and his tendency to borrow ideas are most strikingly illustrated by three ships building or designed at the end of this decade. When Admiral Farragut led his fleet up the Mississippi in 1862, to run the gauntlet of the forts below New Orleans, his flagship was attacked by a cigar-shaped ram, the *Manassas*, whose hull showed only its curved top above the water; and Barnaby may have had this crude little craft in mind when he invented the *Polyphemus*. Our third warship to be built of steel, she was a 2600-ton armoured cylinder with tapering ends, in section the shape of a squat peg-top. A light navigating deck was perched on what was visible of her hull; under water her pointed bow ended in a solid iron ram. Instead of a keel, she had a groove filled with three hundred tons of cast-iron ballast in detachable lengths, by dropping one or more of which loss of buoyancy through damage near the waterline could be corrected. Her ram was to be her only weapon, but the Admiralty, to Barnaby's annoyance, added three torpedo tubes, one in the bows behind the ram, which was made detachable and thus weakened. As the *Polyphemus* served in the Mediterranean, she must have had fair sea-going qualities.

Before she was laid down in 1878, the *Inflexible* had been launched. 'Imagine,' Barnaby said of her, 'a floating castle one hundred and ten feet long and seventy-five feet wide rising ten feet out of the water, and having above that again two round turrets planted diagonally at its opposite corners.'* The ideal layout of the turreted battleship was there to see, in the Devastations, but the *Inflexible*, a reply to the *Duilio* and *Dandolo*, imitated their worst faults, besides embodying a number of her own. The diagonal arrangement of her turrets amidships, as in the Italian ships, was necessitated by the same reason—the concentration of enormously thick armour. The 24-inch plating on the sides of the 'floating castle' was the thickest ever put on any ship, before that day or since. The 'castle' rose from a complete underwater protective deck, but, above this, two-thirds of the *Inflexible*'s length of three hundred and twenty feet was entirely unprotected.

* Thomas Brassey, *The British Navy*, Vol. 1.

More armour would have caused her displacement to exceed the 12,000 tons then thought to be the battleship's limit, a figure she nearly reached. With seventy-five feet of beam, excessive in proportion to her length, she was a tubby ship, and though on her light-draught trials she managed a speed of over fourteen knots, under service conditions this performance went the way of others claimed for her.

In her turrets were the four 80-ton muzzle-loaders from Woolwich. They were loaded externally, by means of loading tubes in the glacis which sloped up to each turret. These guns, said Barnaby, were 'capable of firing all four together at an enemy ahead or on either beam'. On the drawing-board this might be so, but forward and aft of the turrets, joined by a flying deck above them, ran narrow superstructures, or forecastle and poop, and as little more than half of each turret projected beyond them, the inner guns, and probably the outer pair as well, would cause damage by blast if fired directly ahead or astern. When the *Inflexible* discharged eighty-eight of her 16-inch shells at the forts of Alexandria, though the guns were trained on the beam the mere concussion injured the superstructures.

Barnaby designed her with pole masts, but this would not do for the navy, still averting its eyes from the unnatural Devastations. The *Inflexible* must be able to perform sailing evolutions with the fleet. Like the *Téméraire*, but looking much more ridiculous, this ponderous mass of iron was accordingly rigged as a brig, though without bowsprit or foresails. To avoid interference with the arc of training of her turret guns, the shrouds of her steel lower masts were carried up from the narrow superstructures.

Except as an archaic curiosity, the *Inflexible* has only two claims to distinction. She was our first ironclad to have submerged torpedo tubes, and her first commander was Captain J. A. Fisher, who, with a young man from Barnaby's department named Philip Watts, had some small say in her design.

While building, she was confidently pronounced to be the battleship of the future. Four smaller and cheaper ships were made in her image; they dispensed with sails, but were among the worst in the navy. Yet by the time the last two were laid down, in 1879, the scene was about to be transformed. The Admiralty had suffered a great change of heart, and its volatile Director had

come to his senses. Barnaby gave up copying the ships of other navies; the *Collingwood*, begun in 1880, was a reversion to the simple and entirely British three-piece layout. Her barbettes were the one item borrowed, and the guns mounted on them were a sign of grace indeed. After fifteen years, the navy had returned to breech-loaders.

2

The sign of grace was hastened by a mishap entailing loss of life. On 2 January 1879, the *Thunderer*, the *Devastation*'s sister-ship, was carrying out target practice. The process of loading turret guns externally, necessary with the 38-ton Armstrong muzzle-loaders in the *Thunderer*'s forward turret because of their length, was rather complicated. The turret was swung until the guns pointed aft to one of two positions, each thirty-three degrees from the ship's centre line. Here the loading tubes slanted up in pairs from the main deck. The guns being depressed to the small loading ports below the gun-ports in the turret wall, now in line with the loading tubes, charges and projectiles were rammed up the bore by hydraulic power. The loading crews on the main deck knew nothing of what was happening in the turret above.

While this was swung back to the firing position, the guns were elevated to the gun-ports and run out hydraulically by a lever. The recoil after firing was controlled by another lever operating the piston-rod of a hydraulic buffer. The breech ends of these big bottle-shaped weapons, and their mountings, left little room in the turret, but external loading and hydraulic power, as has been mentioned, reduced a gun-crew to a captain and three men. The effect in this confined space of the simultaneous discharge of two 38-ton guns has been described. 'The concussion was tremendous, the whole ship heeling over to port two degrees. The whistles jumped out of the voice-tubes, the glass from the sashes fell in showers, and the faces of the tell-tales and engine-room telegraphs were also fractured.' Everyone in the turret was deafened, and it filled with smoke. On that 2 January these conditions were responsible for disaster.

The gun-captains were ordered to fire the two guns together. The number four of each crew was trained to pull the reverse

lever, operating and controlling the recoil, the instant after the discharge. The guns having been run in, the turret was swung and they were reloaded. Again they were run out and fired together. But this time one burst. Two officers and eight men in the turret were killed instantly, and the blast of flame and metal down the hatchways in the turret's floor injured between thirty and forty men on the main deck below.

It was at first assumed, and at Woolwich rather smugly taken for granted, that the gun was at fault. But an inquiry showed that the human element was responsible. Muzzle-loaders, however big, were fired as they always had been, by means of a priming inserted in a vent at the breech, its flash passing down to the cartridge in the chamber. In the British navy, by the 1870s, the detonating composition contained in a tube or quill, which had replaced the original priming of loose powder, was touched off by friction, either by the old method of pulling a lanyard, or, as in the *Thunderer*'s case, electrically. The gun had burst because this mechanism failed to work when the order was given for the previous salvo, and such was the noise in the turret made by the discharge of a single gun that no one realized that its fellow had misfired. The charge and projectile were still in the barrel when the two were reloaded, and even the immense thickness of the breech end could not resist the explosion of a double charge.

When the 32-pr. was the heaviest ship's gun, bursts through overloading in the excitement of action were not uncommon. With the muzzle-loading monsters now in production the possibility of more accidents of this kind was alarming, and no precautions would be proof against human error. The breech-loader, by its very nature, cannot be double-loaded. The accident on the *Thunderer* decided the Admiralty, already considering the abandonment of muzzle-loaders, to adopt this policy without further delay. All future battleships and cruisers were to be armed with breech-loaders. The decision affected the last pair of small Inflexibles, the *Colossus* and *Edinburgh*, whose keels had just been laid; but it was too late to do anything about the still unfinished *Inflexible* herself. Her 80-ton guns were to be among the museum pieces on show at the Spithead review in 1897.

3

'The great achievement of the Barnaby era was probably the Admiral class, launched between 1882–5, and these were to set the type of British battleship design for the next twenty years.'* This was written in 1960, three-quarters of a century after Barnaby's retirement. The Admirals are remarkable not only for their design, but for the number of them. There were six. After twenty years of experiment, resulting in a fleet in which it was rare to find two ships alike, the Admiralty had taken the plunge, and, for the first time, ordered a whole class.

The Admirals were not in fact all alike, or consistently named. One was the *Camperdown*—a *Duncan* was to follow twenty years later. But in their main features the six ships were identical reversions to the layout of the *Devastation*. Their big breech-loaders were mounted on barbettes forward and aft of a superstructure, in which was a secondary battery. They had two funnels in line and a pole mast with two fighting tops for machine-guns. With the return to breech-loaders the advantages of the barbette over the turret were generally accepted; both embody the principle of the revolving gun-platform, but while the whole of the turret's great weight has to be turned, the barbette's armour is fixed. Its guns can be raised higher above the deck than those in a turret. The *Collingwood*, the first of the Admirals, with a freeboard of only ten feet, carried her big guns nearly twenty feet above the waterline. The gun-crews were protected when the breeches were depressed for loading. In the firing position the guns were, however, wholly exposed, and the French, who mounted them singly, tried putting a partial hood of armour over the breech. With our Renown class of 1897 barbette guns were first given complete protective hoods which turned with them, and this feature, adopted by every navy, led to the term turret coming back, for convenience' sake, to describe the barbette's combination of fixed and rotating parts. Whether on barbettes or in true turrets, which were to make a transient reappearance on British ships, breech-loaders had at first to be trained fore and aft for loading, and barbettes were then pear-shaped.

* A. J. Sims, 'Warships: 1860–1960', a Paper presented at the Centenary Meeting of the Royal Institution of Naval Architects.

The original barbette guns of the *Collingwood*, a ship of 9500 tons, were four steel 12-inch, 43-ton Armstrongs. Compared with muzzle-loaders these were slender, long guns, of thirty calibres, their length being thirty times the diameter of the bore. The use of slow-burning powder greatly reduced the thickness of the breech ends, and even with the additional length this gave breech-loaders a net saving in weight. During gunnery trials one of the *Collingwood*'s 43-tonners blew off its chase, and guns of this type then had the chase strengthened, a sleeve being shrunk over it, raising the gun's weight to forty-five tons. The *Collingwood* retained her 45-tonners, but four of her sister ships, which were larger by a thousand tons, had theirs replaced by 13·5-inch, 67-ton guns of thirty-five calibres.

The sixth and slightly the largest of the class was, as regards armament, in a class by herself. In all navies, under Italian influence, there was still a hankering after very big guns, and this was pandered to in the case of the *Benbow*. She was given two of the biggest then made—16·5-inch monsters weighing a hundred and eleven tons, each mounted on a very high barbette. With four more on her immediate successors, these were the heaviest guns ever put on British battleships.

For their class and their time, the Admirals were fast ships, with speeds approaching seventeen knots. For their partial belts, eighteen inches thick amidships, and the barbette walls, compound armour was used, wrought-iron given a facing of steel, first put on the *Inflexible*'s turrets. There was the now customary armoured deck, but beneath the barbettes the only protection was afforded by coal bunkers, and serious damage here, it was suggested, might bring a barbette crashing down into the ship. The secondary batteries of 6-inch breech-loaders had no side protection.

These secondary batteries were a significant feature of the Admiral class. There was no place for medium-calibre guns on the Devastations, or on Barnaby's 'floating castles', the *Inflexible* and the smaller copies of her; these were our first all big-gun battleships. The 'castle' principle concentrated armour; the return of a mixed armament brought back thinner armour more widely distributed. The mixed armament returned for a double purpose —besides use against an opponent's unarmoured or lightly

armoured parts, secondary batteries were needed to supplement the machine-guns in countering the growing threat of the torpedo-boat.

4

The sights of the 12-inch and 13·5-inch breech-loaders of the Admiral class were marked up to eleven thousand five hundred yards, but no gunnery officer then thought in terms of ranges of several miles. When the First World War began, the power of big guns was overestimated, but it was very much underestimated in the early 1890s. Big guns were then valued solely for their hitting power at very short ranges indeed. In the British navy, with its traditions of close fighting, there was much talk of 'decisive range', and what this might mean is blindingly revealed in an enumeration of the virtues of the *Inflexible*. It was remarked that owing to the diagonal arrangement of her turrets, 'the guns of each turret can be projected clear of the ship's side. . . . They can then be depressed, so as not only to strike a vessel below the line of the armour, *but even to fire down upon the deck, should the enemy be ranged alongside*.'* These words deserve italics; with 80-ton guns, and twenty-four inches of armour, we are back in the days of Trafalgar.

Above all, 'decisive range' meant ramming range. Enthusiasts for this weapon, the potentialities of which were already enormously overrated, must almost have seen the hand of Providence in a series of collisions that resulted in seven ships being sunk or badly damaged by the ram in nine years—two Russian, two French, a Spanish corvette, a German turret-ship, and our own *Vanguard*. The battleships' thwartship bulkheads proved of no avail. To cap these peace-time portents, in 1879, a year after the *Grosser Kurfürst* went down with nearly three hundred men, the now Peruvian *Huascar*, at the third attempt, rammed and sank the old Chilian sloop *Esmeralda*. The evidence seemed convincing; the ram was the king of weapons, and the simultaneous demand for more powerful guns was based on the need of them in a supporting role. At a 'decisive range'—perhaps no more than three or four hundred yards—they were to prepare the way for the ram by battering the enemy into helplessness.

* Thomas Brassey, *The British Navy*, Vol. 1.

It was in conformity with such mistaken tactical views that William White, who succeeded Barnaby as Director of Naval Construction in 1885, followed up the latter's Admirals, the first modern battleships, with a pair that were a throw-back to Reed's fifteen-year-old *Hotspur*. The 10,500-ton *Victoria* and *Sans Pareil*, both launched in 1887, were simply enormous rams.

Like the *Hotspur* and the later *Conqueror*, they carried all their eggs in one basket—two 111-ton guns in a turret forward. Aft of the turret a low freeboard rose in a superstructure extending to the stern and housing a secondary battery of twelve 6-inch guns unprotected against anything bigger than a machine-gun. In an attempt to mitigate the great defect of the design, the concentration of the main armament in the bows, one of the new 9·2-inch, 22-ton guns, with which our heavy cruisers were being equipped, was mounted behind a shield on the spar-deck in the stern. These ships had a single military mast with two tops, and set a fashion that was to be repeated in the Royal Sovereigns and Majestics in having their pairs of funnels abreast.

The *Victoria* was to be yet another peace-time victim of the ram. Her officers who survived this disaster must, however, have found it difficult ten years later to recapture a frame of mind which in all seriousness held that the main purpose of 16-inch guns was to blast an enemy at a range of a couple of hundred yards, or which could picture 10,000-ton ironclads grinding their sides together like wooden two-deckers. We are therefore lucky to possess an imaginative but well-informed account, written not long before the *Victoria* was rammed and sunk by the *Camperdown* off Tripoli, of how in her day she was expected to be used in action.

In a Conning Tower, having appeared in a magazine, was reissued by the publishers of this book, in 1891, as what would now be called a paper-back. The author, H. O. Arnold-Forster, then a member of the firm, was afterwards Parliamentary Secretary of the Admiralty and Secretary of War. Contemporaries, including Barnaby and Lord Brassey, praised the tale highly. 'There is nothing I have seen', wrote Captain Chadwick of the United States navy, a prominent advocate of the ram, 'which comes so near the seaman's idea of what the future sea fight will be.'

The story is told by the captain of the *Victoria*, here named

'*Majestic*'. War with France has broken out, and the battleship leaves Portsmouth unescorted to join the Mediterranean Fleet. Beyond the Lizard she encounters the cruiser *Shannon*, homeward bound after an action with an enemy cruiser. Two days later a strange ship is sighted, hull down. Approaching rapidly, she is soon recognized as a French battleship well known to the *Victoria*'s captain. She has hurriedly left port, also without escort, to intercept the British ship.

As shown in one of W. H. Overend's illustrations to the paperback, the Frenchman appears to be the *Amiral Baudin* or the *Formidable*, probably the latter, the newest of the pair but a few years older than the *Victoria*. High-sided, with a single big funnel and a pair of military masts, each with three covered tops, she carried three 37-cm. (14·5-in.) guns in hooded barbettes on her centre line, one being amidships. Her secondary battery, no better protected than the *Victoria*'s, was very similar—twelve 14-cm. (5·5-in.) guns. She had a complete belt of steel, the *Victoria* a partial one of compound armour. Both ships had torpedo-tubes. Equally fast, capable of over seventeen knots, the two were well matched, for though the *Formidable*'s big guns were less powerful than her opponent's, she had three to the latter's two, and could fire them more rapidly.

Drawing together, head on, at full speed, half an hour after mutual recognition the two ships are only a couple of miles apart, on each other's port bow. The Frenchman then opens fire. The shot falls twenty yards ahead of the *Victoria*, and the narrator comments: 'The range was a long one—too long to my thinking.' A second shot hits, and the British captain has to fall in with his enemy's ideas about range. This being still too long for the 111-ton guns to be laid by direction from the conning-tower, they are laid by the gun-captains and fired as the Frenchman comes on the sights. One shot is seen to go home, but while the guns are being reloaded—with a 16·5-inch breech-loader this would take two and a half minutes—another big shell rips up everything on the *Victoria*'s deck forward of the turret, and a third bursts in her unarmoured port 6-inch battery with frightful effect.

The range is now down to under two thousand yards. The French battleship begins to swing to port, a manoeuvre that will bring all three barbette guns to bear. With the ships continuing

to close at seventeen knots, both are 'in a blaze from stem to stern, the superstructures and batteries in sheets of flame.' The British captain, to avoid being raked, counters the enemy's move by a similar turn away to port. This brings his uninjured starboard 6-inch battery into action, while keeping his turret guns bearing, which owing to the defective design of the *Victoria* he must always contrive to do. Her single stern gun, the 9·2-inch, is far too weak to engage several high-calibre weapons single-handed. As the *Victoria* then ports her helm and circles round, the two great vessels, again on converging courses, are soon 'within three hundred yards, and with our starboard bow presented to the enemy', the account goes on, 'we rapidly approached an even closer and more perilous range.'

The French captain, as is not surprising, appears to have thought three hundred yards close enough, and keeps his helm over. Each ship now fires a torpedo, but both narrowly miss. Immediately after, there is a violent explosion on the French ship. Her guns cease to fire. In a moment they reopen, but the ship loses way and comes gradually round as though to cross the *Victoria*'s bows. She seems temporarily to be out of control.

In describing the restricted view from his conning-tower, the *Victoria*'s captain makes only a passing reference to 'the two long white muzzles' of her turret guns, though they are the heaviest ever carried by a British ship, and in their day were among the most powerful in the world. He reserves his eulogies for the ram—'the most terrible, the most fatal of all the engines of maritime warfare. . . . To receive a blow from the ram is death, the irretrievable catastrophe of a ship's career. To deliver such a blow is certain victory.' Now, at this crisis of the action, the opportunity to deliver that blow has come. The enemy, her speed diminished, is less than three hundred yards from the *Victoria*, and presents almost her full broadside. The captain passes the order to the lieutenant beside him: 'Lay both guns ahead, full speed, and prepare to ram.'

Too late, the Frenchman begins to gather way again. The *Victoria* has to cover less than three times her own length. Under the impact of a final blast from the barbette guns, the roof and part of the wall of the conning-tower are demolished. The lieutenant and a signalman fall dead by the captain's side. But in a

matter of seconds, before he himself loses consciousness, the low bow of his ship enters the shadow cast by her opponent, and 'with a deep, grinding, terrible crash' the ram does its work. In less than a quarter of an hour the enemy has gone to the bottom.

This little work of fiction reflects contemporary opinion and shows how unrealistic this could be. The turret and barbette guns of the *Victoria* and *Formidable* were extremely powerful weapons, and the armour of neither ship could have stood up to their fire at the sort of ranges described. Indeed, had the ships survived to get so near, they would have been blazing wrecks reduced to a sinking condition. It is notable that the author of the story, writing only a few years before the Battle of the Yalu, completely fails to foresee the most common feature of modern naval warfare—internal fires caused by shells bursting among combustibles and explosives.

CHAPTER EIGHTEEN

The Cruiser and the Quick-firer

1

THE first cruisers were commerce raiders and hunters of hostile raiders. Speed being more important than protection, they were unarmoured. Other navies beginning to armour this class in the 1870s, the British navy followed suit. A big stride forward was made by private enterprise in 1884, when the Armstrong firm, now building warships as well as their guns, launched the Chilian cruiser *Esmeralda* at Elswick—the fastest ship of her day, and the most heavily armed for her size. She was later acquired for the Japanese navy, and as the *Izumi* was one of the scouts that sighted the Baltic Fleet before Tsushima. In 1892 the same firm laid down the Japanese *Yoshino*. A protected cruiser (that is, with an armoured deck), with a displacement of 4150 tons, the *Yoshino*'s speed of twenty-three knots made her in turn the fastest warship of her class in the world. Her most remarkable feature, however, both in type of gun and weight of fire, was her exceptionally heavy armament. The *Esmeralda* had mounted two of the new quick-firers; the *Yoshino* had fourteen, 6-inch and 4·7 inch. With twenty-two machine-guns, she could get off some three hundred rounds in ten minutes, from 100-lb. projectiles down to 3-prs. Within a year of her completion she was to show in action what rapid fire could do.

2

The torpedo-boat was responsible for the demand for rapid-firing guns for use at sea, though the cruiser soon showed their value against its own class. The demand was first met by automatic weapons, the machine-guns employed not only by armies but by detachments of ships' companies lent to the military for service on shore. 'Naval brigades' was the British term for these detachments, which were extensively used in our numerous little wars.

Their machine-guns, on wheeled carriages, were hauled by hand. As a ship's weapon, for anti-torpedo-boat purposes, they were given a fixed mounting, generally of pedestal form.

By 1880 several types of machine-gun were in service in the world's navies. All were of Continental or American make—to this day, a lawyer named James Puckle, who died in 1724, remains the sole British-born inventor of a machine-gun.* All, except the Hotchkiss, which fired a 1½-lb. shell, were designed to take small-arm ammunition. They were anti-personnel weapons. They could sweep the decks of torpedo-boats, which, because of the short range and unreliability of the early torpedoes, had to close to within a few hundred yards of the ship under attack; what, however, was still wanted was a gun that would stop the torpedo-boat itself, a small, rapidly moving target, before it got so near. In 1880 the British navy already had Thornycroft's little *Lightning*, which could do eighteen or nineteen knots and from a tube on a turn-table discharged a 14-inch torpedo with a range of five hundred yards. Bigger and faster torpedo craft were building, and within ten years improved methods of propulsion and gyroscopic control had greatly increased the torpedo's range and accuracy.

A beginning towards countering this menace was made when the Admiralty, having returned to breech-loaders, gave the new battleships of the Collingwood class a secondary battery of medium-calibre guns, but it was realized that these 6-inch and 4·7-inch weapons, with a rate of fire at the best of two or three rounds a minute, would need luck or miraculous shooting to disable a torpedo-boat before it got within effective torpedo range; and while the *Collingwood* herself was being built the Board advertised for a gun that would fire twelve rounds in the minute. This cry for help produced the first quick-firers, or quick-loaders, Hotchkiss and Nordenfelt 3- and 6-prs. Cartridge-case and projectile were in one piece, the recoil mechanism brought the gun back in the line of fire, and the action of opening the breech ejected the used case. With these guns a trained man could get off fifteen aimed rounds a minute, and they were capable of stopping the small torpedo-boats of the time, but otherwise they were of little use as offensive weapons. The need for a more powerful

* Charles Ffoulkes, *Arms and Armament*.

double-purpose quick-firer was, however, being met by the invaluable Elswick firm, and by 1886 it had perfected the 4·7 inch quick-firing gun, firing a 45-lb. shell at a rate of ten aimed rounds in forty-seven seconds. This was followed by a much more formidable gun, the famous 6-inch. The existing 6-inch was twenty-six calibres long, weighed five tons, and fired a 100-lb. projectile; the new quick-firer, also a 100-pr., was forty calibres in length and weighed seven and a half tons. At its first trials it scored four hits out of five rounds fired in fifty-five seconds at a target nine hundred yards away. The Elswick-built Italian cruiser *Piemonte*, completed in 1888, was the first ship wholly armed with these types of gun, and they were soon to show that they could be devastating at ranges up to nearly two miles.

The Admiralty was prompt in adopting the 4·7. The 6-inch quick-firer was taken into service in 1890, when its chamber had been altered to take the lighter and shorter cartridge of the new smokeless propellant, a combination of nitro-glycerine and guncotton manufactured in sticks or cords, and hence named cordite —or discord-ite, its introduction leading to much criticism and even litigation. By then the gun's rate of aimed fire had been raised to fifteen rounds a minute. The 6-inch was to remain the standard gun for our battleships' secondary batteries almost up to the *Dreadnought* era and, with the 4·7, was for much longer to arm all but the largest British cruiser.

3

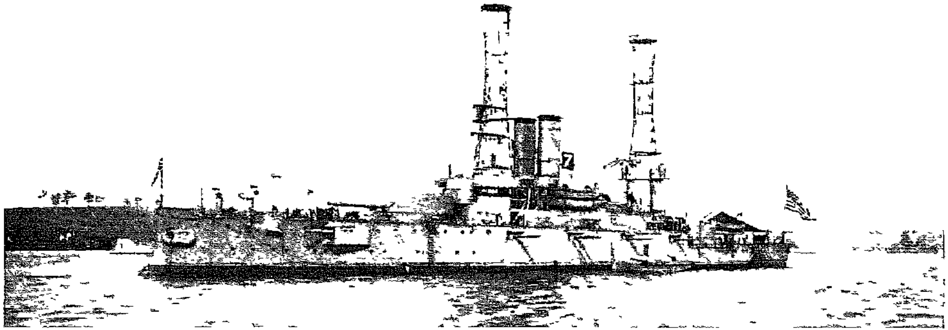
While the cruiser had certain obvious functions, such as scouting, and raiding and protecting commerce, until the end of the century there was much argument about its role, if any, in a fleet action. The problem was soon to become academic, but it was of particular interest in 1896 because it could be discussed in the light of the recent Battle of the Yalu. The Japanese admiral was compelled to pit his cruisers against battleships, and he divided his fleet accordingly into two squadrons, one of fast ships, the other including the most powerfully armed, the squadrons manoeuvring independently. Ten years later another Japanese commander was to be forced to strengthen a depleted battle line with armoured cruisers. Chinese and Russian incompetence left

the problem in the air; but the fate of Admiral Arbuthnot's heavy cruisers at Jutland, after making allowance for greatly altered conditions, suggests what might have happened to the lightly protected Japanese ships at the Yalu, and to the *Nisshin* and *Kasuga* in the fighting off Port Arthur or at Tsushima, had the gunnery of the enemy's battleships been half as good as that of the German High Seas Fleet.

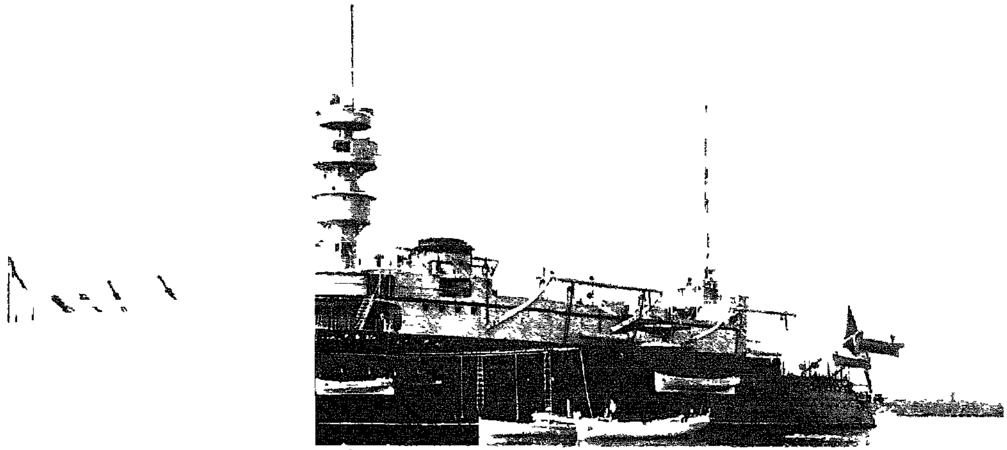
At the time of the war between China and Japan neither country could build warships, except under the supervision of European engineers. Japan had modelled her navy on that of Britain, but while the Japanese were now running it without the aid of foreign instructors, and running it most efficiently, a number of Englishmen and Germans with naval or military experience were still serving in the Chinese fleet at the Yalu. The transformation of Japan from a medieval to a modern state had been so extraordinarily rapid that there were elderly officers in her army and navy—one, at least, served in the field*—who in their youth had worn armour and brandished battle-axes; and as in the Western world there was little understanding of this miracle, or of the depths of incompetence and corruption prevailing in every grade of Chinese officialdom, the result of the fighting at sea came as a surprise. No high opinion was held of the Chinese army, but China had a fairly modern navy, more numerous, and in one class superior, to that of Japan.

On top of other defects, the Chinese navy, like that of the United Provinces in the seventeenth century, came under too many authorities. Of four local squadrons, the two northern, which were the most powerful, made up the fleet that fought at the Yalu under Admiral Ting. There is another seventeenth-century touch in the fact that Ting, like Prince Rupert, had been a cavalry officer. His flag (appropriately according to English phonetics, though the two Tings have different meanings) flew on the *Ting Yuen*, one of a pair of small battleships built at Stettin in the early 1880s. Miniature Inflexibles, at the forward end of armoured citadels amidships they carried four 35-ton Krupp breech-loaders on two barbettes set diagonally. Ting's European advisers were responsible for the removal of light armoured hoods over the barbettes, as they would explode shells that otherwise might pass

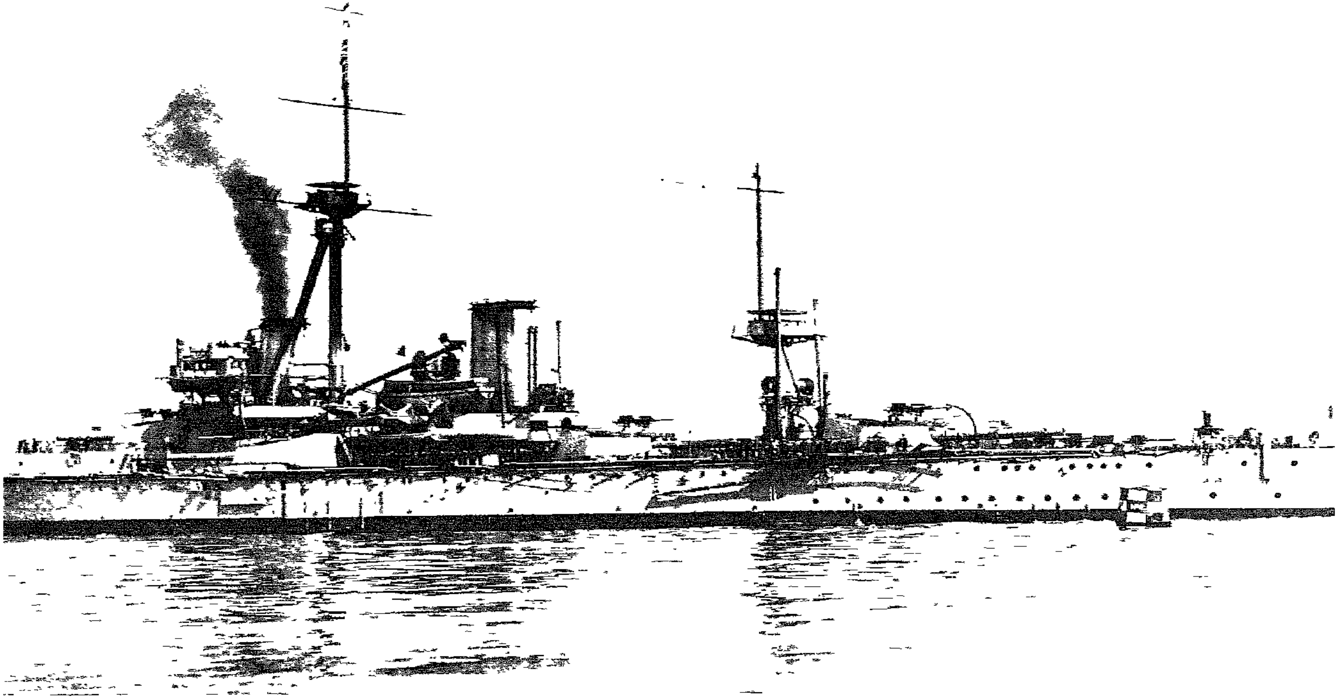
* E. Ashmead-Bartlett, *The Siege and Capitulation of Port Arthur* (1906).



American battleship *Illinois*, 1900, showing the lattice masts



French battleship *Magenta*, 1885, showing characteristic mast



H.M.S. *Dreadnought*, 1906

harmlessly above the guns. At the extreme ends of a narrow superstructure running to the bows and stern were two 5·9-inch guns in turrets. Two funnels in line at the rear of the barbettes, and two masts with fighting tops, complete the picture of these sister ships, which, though in a progressive age already elderly, caused the Japanese more worry beforehand, and more trouble in battle, than all the other units of the Chinese fleet put together.

All that need be said of these ten luckless vessels is that they were small cruisers, ranging in displacement from two of 2850 tons to the 1000-ton *Kwang Ping*. Most of them had been built in British or German yards, and seven were still fairly modern in 1894. Three had armoured belts, and between them they carried seventeen guns of from 8-inch to 10-inch calibre; but of the weapon that was to win the Battle of the Yalu, the new powerful quick-firer, the whole Chinese fleet could muster only two. The cruisers mounted more than forty torpedo-tubes, and several small torpedo-boats were attached to the fleet.

In spite of the presence of the two Chinese battleships, the Yalu was essentially a cruiser battle. In this class the Japanese fleet was immeasurably superior, and it was a mistaken policy to include in it, merely to equalize numbers, two slow vessels fifteen years old, a 600-ton gunboat, and an armed liner added at the last moment to make up the dozen. Knowing that few of the Chinese ships could reach anything like their nominal speed, Admiral Ito formed a Flying Squadron of the four fastest of his eight formidable modern cruisers. He led the Main Squadron in the *Matsushima*, one of three sister-ships that had no like in any other navy. When, in view of eventual hostilities with China over the control of the peninsula of Korea, Japan decided to create a powerful cruiser fleet, the need was felt for some sort of counterweight to the Chinese battleships with their 12-inch guns and fourteen inches of armour. To meet it the *Matsushima* and *Itsukushima* were built at La Seyne, and the *Hashidate*, under the direction of her French designers, at Yokohama. Ships of 4300 tons, fast but lightly protected, each carried on an armoured, hooded barbette a 12·5-inch, 66-ton Canet gun throwing a much heavier projectile than the Chinese battleships' elderly Krupps. It is, however, with this trio's secondary armament, totalling thirty-four 4·7-inch quick-firers, that we come to the superiority

in fire power upon which Admiral Ito mainly relied. With fifty-eight 4·7s, and eight 6-inch, his fleet had sixty-six of these guns to the Chinese two.

On the evening of 16 September ten of Admiral Ting's twelve ships were at anchor off the mouth of the Yalu River, the boundary between Korea and Manchuria, to which he had escorted some troop transports. The *Ping Yuen* and the little *Kwang Ping* had gone into Takushan harbour. Early the next morning the smoke of the Japanese fleet was seen over the south-west horizon. The Chinese admiral weighed and steamed towards the enemy at six knots, forming his fleet in line abreast. Ting made the mistake of putting his battleships, the *Ting Yuen* and *Chen Yuen*, with his armoured and protected cruisers, in the centre of his line, instead of employing them to protect its wings. As the Chinese signalling system was virtually non-existent, in the coming battle the fleet would have to make do with orders amounting to little more than instructions to follow the movements of the flagship. Ting had no admiral under him, and did not appoint a second-in-command.

The Japanese, in line ahead, came on at twelve knots, the Flying Squadron under Admiral Tsuboi, in the *Yoshino*, leading. The day was cloudy, with a strong east wind setting up a stiff sea. By midday the range was down to six thousand five hundred yards, and the *Ting Yuen* tried some rounds from her 12-inch guns. Though they fell short, most of the other Chinese ships opened a wasteful fire. Practice with heavy guns was so rare in the Chinese navy that Ting and his staff, incautiously standing on the bridge above the flagship's barbettes, were thrown down by the concussion of this first salvo, and the admiral, knocked unconscious, was taken below. The fleet was now without a commander. The grey Chinese line was already ragged; the Japanese, painted white, in beautiful order and manoeuvring by signal, approached it obliquely until, at three thousand yards, the Flying Squadron turned in succession eight points to port and put on speed, and the whole fleet, sweeping across the enemy's bows, began a tremendous and very rapid fire. Such a hail of shells had never hitherto been seen or imagined. On several Chinese ships, over-adorned with paint and lacquer, fires broke out at once.

The Flying Squadron closed to within a mile of the Chinese

right wing, still without the two ships from Takushan. Two weak cruisers were driven out of the line ablaze. The squadron was then recalled by signal to protect the old and slow Japanese ships, which had fallen astern and were in difficulties, while Ito, with the more powerful units of the Main Squadron, circled inside it round the Chinese right. Such of Ting's ships as were still in some sort of line were now between two fires. The two battleships appear to have manoeuvred together at their best speed, probably less than ten knots; but the rest of the fleet had lost all organization. From now onwards the action was fought in clouds of smoke from fires, funnels and powder—the Japanese coal was very dirty, and of twenty-four ships only the *Yoshino* used cordite—and though it went on for two or three hours, accounts of the later stages are very confused.

With his enemy in disorder, it was time for Ito to employ the tactics for which he had organized his fleet in two divisions. While the Flying Squadron hunted down the scattered Chinese cruisers, the Main Squadron, now reduced to its four most powerful ships, three of them with 12·5-inch guns, concentrated its efforts on the two battleships. His cruisers being very lightly protected, Ito kept the range at two thousand five hundred or three thousand yards. This was well within the scope of his quick-firers, and of these his squadron had two-thirds of the total in his fleet.

His flagship had already had an escape from serious damage. While sweeping round the Chinese right wing she had been engaged with the belated *Ping Yuen*, coming from Takushan, at only thirteen hundred yards. The *Matsushima* was hit by a 10·2-inch shell which, fortunately for her, proved to be loaded with cement. She was not to be so lucky when the Main Squadron took on the Chinese battleships. Soon after three o'clock a 12-inch shell burst in the *Matsushima*'s side battery. It blew a 4·7 from its mounting, exploded a pile of ammunition, killed or wounded a hundred officers and men, and started a fire on the lower deck just above the magazine. While her crew fought the fire, the *Matsushima* hauled out of the line, but later rejoined.

By now the Chinese battleships had almost run out of common shell for their big guns. They are said to have had only fifteen rounds per gun, though their magazines were full of armour-piercing shot. Ting had resumed command, and between 4 and

5 p.m., with his battleships, three cruisers and the torpedo-boats, he steered for Port Arthur. This was all that was left of his fleet. Two cruisers had been sunk by gunfire, and two were sinking; a fifth, after a collision while she was attempting to escape, ran ashore and was later destroyed by the Japanese; two had fled. Every ship that stayed to fight, including the battleships, had been on fire, most of them several times. There were eight fires on the *Chen Yuen*. The *Lai Yuen*, one of the two biggest cruisers, was almost gutted, but somehow got to Port Arthur.

Admiral Ito did not press the pursuit. Some of his ships may have been running short of ammunition, the enormous consumption by quick-firers not having been foreseen. The early night was approaching, and it is probable that he did not want to risk a night attack by the enemy's torpedo-boats. These had effected nothing during the battle; one had engine trouble, and though a second came under close fire before discharging several torpedoes, she failed to make a hit. Ito had no torpedo-boats with him. The Japanese had seven divisions, or flotillas, totalling forty boats, but because of the short range of the torpedo at that time it was regarded as a weapon to be used mainly at night. Their cruisers fired none. The Chinese cruisers let off a number at long range, but more from anxiety to get rid of dangerous explosives near the waterline than in the hope of hitting anything.

In failing to follow up his victory, Ito may also have been influenced by the stout resistance of the Chinese battleships, whose shortage of 12-inch shells was unknown to him. Their superstructures were riddled with holes, the work of the Japanese quick-firers, but the big Canets had done no more than dent the armoured citadels and barbettes. At one time all four of the *Ting Yuen*'s barbette guns were out of action, but three were firing again before the close. She met her end at Wei-hei-Wei, but her sister-ship, as the *Chin Yen*, was a unit of the Japanese fleet in the war with Russia.

4

As the first fleet action since Lissa, and the first fought under modern conditions, the Battle of the Yalu received less attention than it merited. Once the inefficiency of the Chinese fleet was

realized, European naval opinion, except among a few keen gunnery officers, took the comforting view that this explained everything. In any case, it was felt that the navies of Oriental powers only a few decades removed from barbarism could have little to teach those of the Western world, with their established traditions and long professional experience.

There were, in fact, many lessons to be learnt from the Yalu. Some were to be rubbed in four years later at Santiago, and others, since the Japanese profited by them, at Tsushima. Because, however, of the losers' marked inferiority in all three battles, these lessons continued generally to be disregarded. Besides the Japanese, only the new German navy, and, to some extent, that of the United States, took them to heart.

The most important was the smothering and demoralizing effect of rapid and accurate gun-fire, even if the accuracy did not reach later standards. Its corollary was that a fleet with decided fire superiority could destroy the enemy's fleet without suffering serious loss or damage. In spite of Lord Fisher's gospel—'Hit first, hit hard, and keep on hitting'—it took the disaster of Coronel to bring this home to the British navy.

Another lesson of the Yalu, also underlined at Santiago, was that big guns, which alone could disable battleships, were worth very little at quite moderate ranges with the then existing methods of fire control. At the Yalu, eleven 12-inch guns fired between them at least three hundred rounds, and scored perhaps three per cent of hits; at Santiago, the fourteen 13-inch and 12-inch guns of the American battleships fired eighty-six rounds and made two hits, though the range was sometimes down to fifteen hundred yards. These big weapons then took too long to load and lay to follow quickly moving targets. In both actions it was the medium-calibre guns, especially the quick-firers, that established superiority from the start. Whether big or medium, however, it was made clear at the Yalu that hitting at all involved an enormous expenditure of ammunition.

That action first drove home the danger of fires from bursting shells, and most navies took steps to reduce it by doing away with much superfluous woodwork. The Spaniards having neglected this precaution, their big armoured cruisers were rendered helpless at Santiago by the fires raging on their decks.

Next to the crushing advantage of superior fire power, the Yalu demonstrated the value of superior speed and tactical training. The Japanese fleet, its two squadrons manoeuvring by signal, could make the range what it chose and avoid the mêlée which Ting's formation of line abreast was designed to bring about. Attempts to ram by his slower ships were doomed to failure; if one was made, it was an act of desperation by a Chinese cruiser, and she was sunk by gun-fire while still far from the Japanese line. A feature of the action was the deadly effect of the new quick-firers upon lightly armoured ships at quite long ranges; once the fall of shot showed that the target had been straddled, in such a hail of projectiles some were bound to hit. The *King Yuen* is said to have been sent to the bottom by the fire of two opponents three thousand yards away. The few officers in European navies who were not too complacent to learn from the Battle of the Yalu were soon to solve the problem of how to use the heavy gun by extending this method in the form of 'calibrated' salvoes fired at ranges that would have been thought fantastic in 1894.

CHAPTER NINETEEN

A New Century and a New Era

1

WHEN the last of the Admirals, the *Anson*, took the water in 1886, the new era in battleship design foreshadowed by the *Devastation* was also fairly launched. In the British navy, after a brief unhappy lapse with the *Victoria* and *Sans Pareil*, the type established itself firmly. For twenty years class was to succeed class, often in large batches of sister-ships—seven Royal Sovereigns between 1892 and 1894, then eight Majestics, the process winding up with the eight King Edwards, the last British capital ships designed by Barnaby's successor, William White. Each class was an improvement on the one before. Compound armour was replaced by steel alloys, wire-wound guns using high explosives gained increased penetration and destructive power, displacements rose to above 16,000 tons, water-tube boilers helped to raise speeds to nineteen knots. Barbettes became armoured towers descending to magazines below the waterline. But in the disposition of their armament, in their thundering reciprocating engines, in essentials and in appearance, all these ships were very much alike, and all derived from the six Admirals.

Such an era of sober progression and general uniformity, like the annals of a blameless and prosperous life, makes somewhat monotonous history—strikingly so in contrast with the incessant contrivance and variety of the earlier twenty years, when the ironclad was sowing its wild oats. In the case of the Royal Navy, a dull outward view unhappily reflected its inner state. Lacking the stimulus of experiment and uncertainty, what started as a big step forward fell away to repetition, stodginess and complacency. This was the national mood of the time, and too many naval officers, like the untutored public, felt that with everything going so well there could be nothing wrong with the handsome ships, shining in black and cream, that carried the flag all over the globe. Sir William White also held this view; unlike his immediate predecessors, he was no innovator, but was perfectly happy developing

sound standard designs in his own deliberate way. Not all the designs were even sound; some of White's battleships shared with his armoured cruisers (which were also undergunned) the defect of having the secondary battery on the main deck, from which the guns could not be fought in a heavy sea.

Other navies, in the meantime, were taking the new type of British capital ship as a model. With the St. Louis class, contemporaries of our Majestics, the French abandoned the lozenge arrangement of barbettes, a relic of the days of sailing rigs, for pairs of guns mounted forward and aft. The new German battleships built under the Navy Act at the end of the century, while designed internally to meet special requirements, adopted the same outward pattern. Only the Russians, once so enterprising, had got into a rut. They clung to turrets and very high-sided ships retaining other archaic features. The Osliabia class, of round about 1900, had their guns on three decks. They presented enormous targets, and the *Osliabia* herself was the first ship to be sunk at Tsushima.

When in that battle the destruction of the Russian fleet was completed, the era inaugurated by the Admirals twenty years before was about to come to as sudden and unexpected an end. Five months later, the keel-plate of a new *Dreadnought* was laid at Portsmouth. Conservative 'salt-water' sailors, realizing what must happen to their beautiful ships, called Sir John Fisher a traitor, but recent verdicts on the Royal Navy of the passing era are that 'behind an impressive façade there was little of solid worth either in the design of its ships or in any progressive thought on the part of its senior admirals,'* and, more roundly, that it 'was in certain respects a drowsy, inefficient, moth-eaten organization.'†

2

By the last decade of the century admiralties were becoming haunted by fear of the torpedo. Battleships were provided with torpedo-netting, housed in sections on shelves along the ship's

* P. K. Kemp (ed.), *The Papers of Admiral Sir John Fisher* (The Navy Record Society, 1960).

† A. J. Marder, *From the* Dreadnought *to Scapa Flow* (O.U.P., 1961).

side and lowered from steel booms to form a complete protective curtain. If a ship was under way with her nets down, by its drag in the water this skirt of chain mail, weighing a good many tons, seriously cut down her speed. It was soon rendered ineffective, the warheads of torpedoes being given cutting instruments which sheared through the steel mesh; and since until after the Second World War the torpedo left a visible wake, it was by then realized in most navies that the best protection against it was a ship's ability to evade it by speed and manoeuvring. The British, however, clung to their nets until the 'blister' or bulge was invented during the last war. This was a minutely subdivided shock-absorber fitted outside the ship's hull below the waterline. It was universally adopted, but it also affected speed, and in post-war designs the bulge was fitted internally to the outer hull.

Among early devices to counter the torpedo-boat was the interceptor, a small fast ship armed with light quick-firers and machine-guns, and classed as a torpedo-gunboat. It was also given torpedo-tubes, and in two actions in South American waters this type of vessel was employed successfully as a torpedo-boat. In both cases the target, a small battleship, was at anchor. In the British navy the torpedo-gunboat was soon superseded, early in the 1890s, by the torpedo-boat destroyer, which in turn took over the functions of the craft it had been designed to destroy, and others as well. The torpedo-boat was too small to remain at sea for long, or in rough weather; the destroyer developed until by the end of the First World War the British navy was building some of 1500 tons and the Germans even bigger ones, though still calling them torpedo-boats. Speeds had risen to above thirty knots. One of the main duties of destroyer flotillas was that of acting as a screen to the battle fleet, particularly against submarines, which by then had greatly intensified the moral influence of the torpedo. When the Second World War came, the newest German torpedo-boats were ships of 2260 to 2690 tons able to do thirty-six knots. With five 5-inch or 5·9-inch quick-firers, in addition to eight torpedo-tubes, they were as powerful as the older light cruisers of the First War.

3

Concentration on the first antidote to torpedo-craft, the quick-firer, may possibly have helped to prolong the neglect of the big gun. This was in no way the fault of gun-makers, who were continually devising improvements, In the quick-firing type, by 1895 there were half a dozen progressive patterns or Marks of the 6-inch in the British navy. Among heavy guns there were as many of the 9·2; and it was this weapon that first embodied the most notable gunnery innovation of the period. A wire-wound gun had been patented by John Longridge as far back as 1870, and a few years later this type was being made by the Armstrong firm. By winding steel wire round the 'A' tube of a gun the tube was strengthened, enabling larger charges of propellant to be used, while danger from a flaw in the tube itself, which no system of testing or care in manufacture could entirely eradicate, was greatly minimized. The wire-wound gun had better penetrating power and accuracy, and a higher rate of fire, than its predecessors of similar calibre. In 1887 a regenerated Woolwich made the first wire-wound 9·2, and in 1890 the Ordnance Committee, belatedly created at the Admiralty, recommended the adoption of the method for all types of gun, from the biggest down to the 4·7. In the late 1920s the wire-wound gun was to be superseded by an all-steel gun.

The barbette guns of the Royal Sovereign class, then the latest type of battleship, were the 13·5-inch, 67-tonners first put on four of the six Admirals. In a new class being designed, the nine Majestics, 12-inch wire-wound guns were substituted. Weighing only forty-six tons, in rate of fire, accuracy and hitting power, they were superior to the older higher calibre weapon. Nearly half the weight went in a hundred and thirteen miles of wire round the 'A' tube.

It was all very well to have better big guns, but when the *Majestic* was completed in December 1895, the Royal Navy was still in its bad mood of stodginess and complacency, unhappily reminiscent of the years after Trafalgar. A ship's efficiency was judged by superficial smartness—spotless decks, gleaming metalwork and enamel, speed in carrying out such evolutions as 'away

all boats', 'out collision mats' and 'out nets'. Fleet training consisted of showy but unrealistic manoeuvres, which made the reputation of such admirals as Sir George Tryon, who in the course of one had his flagship rammed and sunk with the loss of 321 lives.

When it came to gunnery, what was called battle practice was still conducted in the equally unrealistic world of fixed targets and short ranges. It could perhaps be argued by senior officers, who were content with this, that while big guns were enormously improved, increased muzzle velocity and rate of fire were wasted as long as accuracy was limited, as it still was, by visual checking. Range-finders were in use, but they were unreliable beyond three thousand yards, a distance at which binoculars could normally follow the fall of shot. Battle practice, however, could and should have been carried out at this range, and against moving targets at all ranges; but even these reforms were not effected until the last year of the century.

That they were effected so soon, a fortunate thing for the country, was due to the efforts of Sir Percy Scott and his staff in the *Excellent*, the gunnery school at Portsmouth. To improved range-finders Scott added such inventions as the 'dotter' (a miniature target moving in a frame in front of the gun muzzle), the deflection teacher and the loading tray—methods of loading and aligning sights through a ship's roll. Battle practice being actually carried out at three thousand yards in 1899, it was up to five thousand yards the next year, and it had risen to eight thousand yards by 1906. Scott's greatest gunnery reform was his system of 'director' firing. An officer perched high up on a control platform on the foremast laid the ship's big guns by means of a director sight connected to the turrets by an electrical circuit. When the sight, and therefore the guns, were on the target the control officer pressed a button to complete the circuit and fire the guns simultaneously. The salvoes were calibrated to make a small spread which enabled the fall of shot in relation to the target to be checked, while it increased the chances that some would hit. This system was later extended to secondary batteries. A final refinement was a transmitting station in a protected part of the ship from which information of changes of range and course, barometric and wind pressures, and the amount of elevation and

of 'aiming off' required, was worked out by an electronic calculator and passed to the gun turrets.

The general adoption of director sights was retarded for some years by a difficulty inherent in the use of mixed armaments. It was expected that fleet actions would be fought at ranges within the scope of battleships' secondary batteries, when it would prove impossible to distinguish between splashes caused by shot of two or more different calibres falling together. The Americans attributed to this cause the very poor shooting of their big guns at Santiago, the fall of 12-inch and 13-inch shells being lost amidst the more numerous splashes from medium-calibre weapons. Yet in the first years of the new century several classes of battleships with three types of heavy and medium guns were added to the United States navy, and similarly on our contemporary King Edwards four 9·2s were sandwiched between the main armament and the normal 6-inch equipment of the side battery. In our next and last class of this type of capital ship the types of gun were again reduced to two.

This problem apart, the inventiveness of Sir Percy Scott and his school, and the energetic, if unpopular, support of Sir John Fisher, who between the late 1890s and 1904 was successively Controller, Second Sea Lord and First Sea Lord, combined to bring about an enormous improvement in the navy's gunnery. In 1897, when battle practice meant firing at stationary targets at a range of a mile or so, the percentage of hits was under thirty-two; by 1906, with towed targets and ranges up to eight thousand yards, it had risen to the high figure of seventy-one.* When the secondary armament, discarded by the *Dreadnought*, returned with her successors, the increasing range of the torpedo had further extended the practice range of big guns. By 1914 this was up to fifteen thousand yards. Big guns were very inaccurate at extreme range but most accurate at something near it. Admiral Beatty said that sixteen thousand yards was the ideal for the 12-inch of the First World War.

The longer the range, the more wasteful and expensive was the plunging fire of heavy guns. It took twelve hundred rounds of 12-inch shell to sink the *Scharnhorst* and *Gneisenau* in the Falklands' battle. In the next war, when the 15-inch guns of the *Hood*

* Randolph Pears, *British Battleships: 1892–1957* (Putnam, 1957).

and *Bismarck* opened fire at twenty-five thousand yards, or over fourteen miles, it was estimated that at such ranges only five per cent of hits was to be expected.

4

The world's fleets of wooden ships rendered obsolete by the ironclad differed only in minor details. The ironclad itself, on the other hand, once it had grown out of the bondage of sail, offered unlimited scope for surface treatment, and that of the battle fleets of the 1890s, soon in their turn to be superseded, rather amusingly reflects national characteristics.

British battleships from the Admirals to the King Edwards were thoroughly British in appearance. Like an Englishman's clothes, the style altered little in twenty years; it was unobtrusive, discreet, gentlemanly and unimaginative. Among superficial changes were the disappearance of fighting tops and their replacement by gunnery control platforms, and the abolition (to the grief of the 'spit and polish' school) of glossy black and cream paintwork in favour of an overall dull grey.

Very different was the picture across the Channel. French battleships ran to a variety of types, all having a rather flamboyant air. In some classes there was a rash of turrets for guns of all calibres—the *Bouvet* and *Masséna* had twelve—and masts were stout hollow tubes having sometimes as many as three covered tops. For a time a style aptly called 'fierce-face'* was in vogue; sides had an exaggerated tumble-home, tops were as big as houses, and a huge prow curved like a beak above the waterline.

Equally individualistic was the American navy, which began a new life in the 1880s. Its first capital ships and big armoured cruisers, built in the next decade in time to meet and overwhelm the forlorn hope sent out from Spain, tended to run to very tall slender funnels and a stump of a foremast. At the end of the century a unique type of mast was coming in—a very lofty structure of steel lattice-work with a shallow top perched on the summit. Looking like a compressed waste-paper basket, it combined lightness with strength.

* Oscar Parkes, *British Battleships, 1860–1950.*

Among other navies of the 1890s that of Russia is remembered because of its fate. Russian naval architects were no longer inventive and enterprising, and the fleet was a miscellaneous collection of ships of old-fashioned design. Except for the units in the Black Sea, it was soon to be utterly destroyed. The survivors were to be added to the fleet which, by the end of the century, Japan was creating in the image of the Royal Navy, all but one of its first six capital ships being built in British yards to our own late-Victorian pattern.

The German navy of this period remained inconsiderable and little regarded, but its remarkable growth was in the planning stage. Though as the new century dawned the British navy could still muster as many ships as any other two, by the German Navy Acts of 1898 and 1902, and their provocative wording, its supremacy was threatened; and as a direct result the naval scene was once more to be transformed. Designs for an entirely new type of battleship had already been prepared at Portsmouth by Sir John Fisher and his old colleague, Philip Watts, now Director of Naval Construction; and when, in May 1902, Fisher became Second Sea Lord and, as it has been put, 'set about upturning the ant-heap',* the end of all existing types was in sight.

5

One hundred and seventy capital ships, the total in commission among the leading naval powers in 1906, were not, of course, rendered obsolete at a stroke, as is sometimes rather sweepingly stated; but from that autumn, when a new *Dreadnought* was completed, it was clearly only a matter of a few years before the newest of them would disappear from the battle line. In the Royal Navy, which accounted for a third of the total, these were the King Edwards' successors, the *Lord Nelson* and *Agamemnon*. Ships of 16,500 tons, their triple expansion reciprocating engines gave them a speed of eighteen and a half knots. Their armour, twelve inches thick on the belt amidships and on the barbettes, and eight inches on the turret walls, was an improved form of the nickel steel hardened plates produced by Krupp, which had

* Captain Donald MacIntyre, D.S.O., D.S.C., R.N. (Ret.), *Jutland* (Evans Bros., 1958).

succeeded the American Harveyed steel introduced in our navy on the Majestics. As the standard arrangement of two pairs of 12-inch guns was combined with a secondary armament of ten 9·2s, also in hooded barbettes, the 6-inch being dropped, the *Lord Nelson* and *Agamemnon* were considered an outstanding advance on previous classes. Yet while they were being built, the *Dreadnought* was begun, launched and completed. Stripped of all auxiliary weapons above 12-prs., she had two more 12-inch guns than any two of her contemporaries mounted between them. Turbine engines could drive her at twenty-one knots. The *Lord Nelson* and *Agamemnon* found themselves out of date before they left the slips; and by the time the latter was ready for sea, such was the new energy infused into British yards that six more Dreadnoughts were in hand.

When war came in 1914 the navies immediately involved still had in commission ninety-four pre-*Dreadnought* battleships, thirty-eight being British. But of all these only a handful ever fired a shot at an enemy's ship of anything like comparable force. The High Seas Fleet at Jutland included a squadron of six, and eighteen months earlier the old *Canopus*, berthed on the mud at Port Stanley in the Falklands, let off a few rounds, which fell short, at the *Gneisenau*. Such elderly survivors of the past era were regarded as expendable, and five British and two French were duly expended at the Dardanelles. As regards the role which class after class had been designed to fill, in the battle line, twenty years' painstaking growth had gone for nothing.

Strictly speaking, the idea of the all-big-gun type of ironclad was not new. The *Inflexible* and the Devastations and their Italian contemporaries had belonged to it, and more recently it had been advocated by the Italian designer Cuniberti and by naval officers in America, among them Lt.-Commander Sims, later to be well known to us. What was new was Admiral Sir John Fisher. In the long history of the Royal Navy there had been many forceful First Sea Lords, but none so determined and ruthless as Fisher. To get done what he felt must be done he split the service in two, but he achieved his aim.

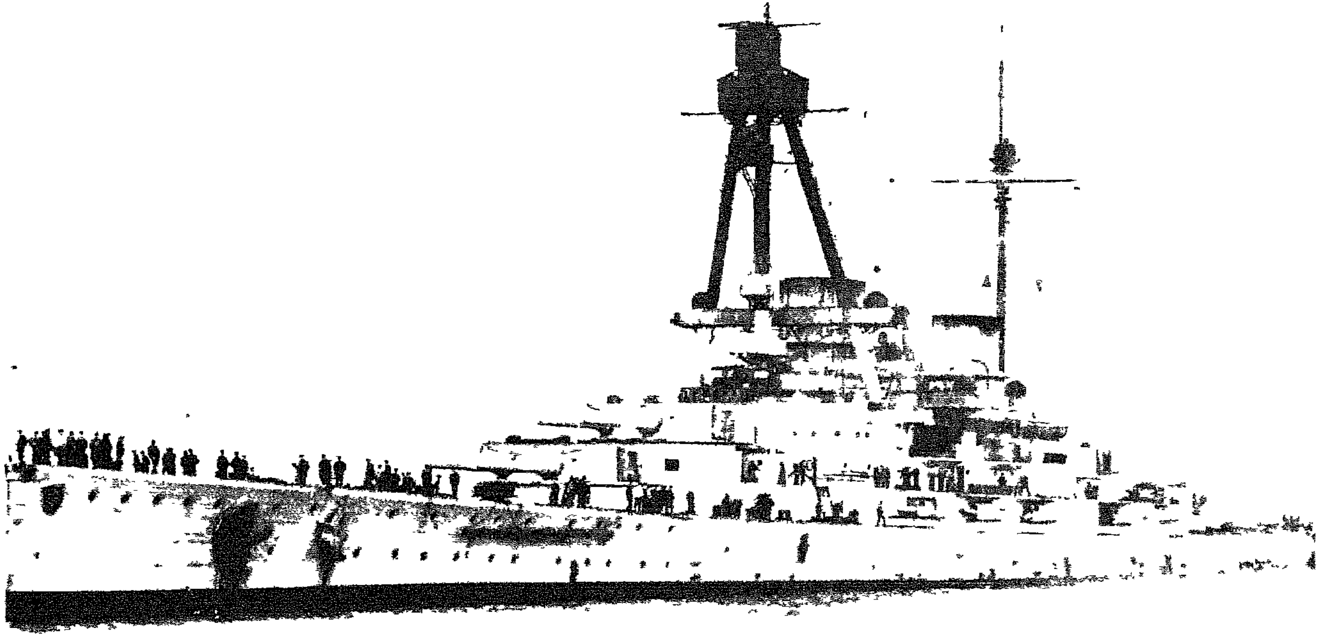
With the idea of the all-big-gun ship in the air, Fisher saw that before long such a ship would be designed. For once the British navy must depart from its traditional custom of waiting for

other navies to introduce innovations—it must introduce this one itself. The plan entailed another innovation; for if Britain was to gain a substantial lead in a class of ship that would render existing classes obsolete, the prototype must be built in the utmost secrecy. This again, for reasons of security, meant that the ship must be built very quickly. Building battleships had been a leisurely process, in recent times often a matter of three or four years, and Fisher himself had a hand in cutting the time down to two; but if the construction of the new *Dreadnought* was to be kept secret, two years was far too long. Her keel-plate was laid at Portsmouth on 2 October 1905; by a remarkable feat of drive and organization, and by appropriating the 12-inch guns of the *Lord Nelson* and *Agamemnon*, she was ready to proceed on her trials a year and a day later. The necessary lead had been obtained. The first German Dreadnought was not laid down for another nineteen months, and in that time, with the experience gained in building the *Dreadnought* herself, we had a further six approaching completion.

These ships embodied other novelties besides their single-type armament of ten 12-inch guns. As reciprocating engines grew bigger and bigger their ponderous whirling masses of metal became increasingly cramped by the armoured deck above them. At high speeds they suffered great wear and tear, and breakdowns were common. The Dreadnoughts were given turbine engines, quiet and clean and more powerful, and their speed of twenty-one knots was two knots higher than that hitherto attained by any British battleship. They were the first British ships designed to burn oil as well as coal, and the first to dispense with the long discredited ram.

It was, however, their guns that gave these ships their tactical importance. Hitting power apart, the fact that all ten were of the same calibre did away with the confusion caused by mixed armaments. A salvo of shells of the same calibre, calibrated to make a small spread, taking the same number of seconds in flight and raising simultaneous splashes, at last gave the gunnery control officer a means of ranging accurately on the target. According to whether the great fountains of water fell short or beyond it, he increased or reduced the range until the target was 'bracketed', when hits should follow.

With ten guns in pairs in turrets, to enable the greatest number



German battle cruiser *Derfflinger*

The Grand Fleet at sea

to fire together in a given sector the whole arrangement of a ship's upper works had to be simplified. Superstructures were reduced to a minimum, and placed so as to interfere as little as possible with the turrets' arcs of fire. The *Dreadnought* herself had a single tripod mast, not seen since the days of the early turret ships; her immediate successors had two. In this class there were three turrets on the centre line of the ship and two disposed abreast a little forward of amidships. Six guns could thus fire ahead, six astern, and eight on the beam. The disposition was not ideal, and foreign navies, led by that of the United States, when they had recovered from the shock of this revolution in battleship design and began to build their own Dreadnoughts, introduced the superposed turret, which enabled all turrets to be placed on the centre line. The rearmost of a pair forward and aft was raised, so that its guns fired over the turret in front. While this limited to four the number that could fire directly ahead or astern, all could fire on the beam, a concentration of vital importance in the normal line ahead formation of a battle fleet. We adopted this system with the after turrets of the Colossus class of 1911, and completely in all later classes. It was extended to cruisers and destroyers.

From the *Dreadnought*'s 17,000 tons, standard displacement increased steadily through her 12-inch gun successors to the 22,500 tons of the first super-Dreadnoughts, armed with 13·5-inch guns. The Queen Elizabeths, completed in time for the Battle of Jutland, with 15-inch guns and a speed of twenty-five knots, displaced 27,500 tons or 33,000 tons at full load. Oil was their only fuel.

The *Dreadnought* herself was still building when the first of another class of capital ships was laid down. The battle cruiser was one of Lord Fisher's many pet projects. To make her faster than any battleship, she was more lightly protected and carried eight big guns instead of ten. The original function of the battle cruiser was to overtake and overwhelm the enemy's armoured cruisers sent out to harry commerce. The Germans built a number of powerful ships of this type with which they were expected to raid our trade routes. The action off the Falkland Islands, in December 1914, when the *Invincible* and *Inflexible* destroyed the *Scharnhorst* and *Gneisenau* (expending nearly all their 12-inch

shells in doing so) was a text-book example of the battle cruiser in this role. But the opportunity did not recur, and already a rather vague idea that the type would prove useful in a fleet action in finishing off the enemy's disabled battleships had grown into a more ambitious doctrine. Battle cruisers were to employ their speed to fasten upon the hostile fleet until their own arrived upon the scene, when they would take station ahead of it. It was proved at Jutland that British ships of this class could not take the punishment their own guns inflicted; and the lesson was repeated twenty-five years later, when the 41,000-ton *Hood* was blown up by a salvo from the *Bismarck*. Though designed after Jutland the *Hood*'s main deck had only three inches of armour, and the roofs of her turrets five inches.

6

The Battle of Tsushima was fought a few months before the *Dreadnought*'s keel was laid. The Russian Baltic fleet was a scratch collection of ships, old and new. It had come half-way round the world, and it went into action with coal piled on its ships' decks, the extra weight sinking their armour belts too low. Though it included more so-called battleships than the Japanese fleet, it was in every respect hopelessly inferior. Admiral Togo, having lost two of his own six battleships by mines in one day, anxiously preserved the remaining four until Port Arthur fell. At Tsushima, where he reinforced his depleted battle line with the two Italian-built armoured cruisers *Kasuga* and *Nisshin*, he could take risks. During the long voyage of the Russian fleet ample information of its indiscipline and lack of training reached him. He calculated correctly that its reserves of coal were insufficient for a route to the eastward of the mainland of Japan, and that it must therefore steer directly for Vladivostok through the Strait of Tsushima. To make things easier for him, fear of torpedo-boat attacks at night caused the Russian admiral to attempt to pass the Strait in daytime.

At the very start of the battle, in spite of having to nurse his reciprocating engines, Togo's superior speed enabled him to enfilade the Russian van. Already in disorder because of a cancelled signal, the whole line was at once thrown into confusion.

The coal on the decks caught fire. The Japanese then closed to a range that would have been hazardous had Russian gunnery been better. Broken off by Togo for a few hours, the battle was resumed in the evening, and became a massacre. After torpedo-boat attacks at night, and the final pursuit next day, twenty-one ships of the Baltic Fleet had been sunk. Seven were captured. The Japanese did not lose a ship. It was the most crushing victory on a big scale since Trafalgar.

A point that emerged from the close fighting at Tsushima was that at two thousand or three thousand yards battleships could take a lot of punishment from 12-inch guns. In the daylight fighting the Japanese fired a number of torpedoes, but only the *Suvaroff*, already crippled, was sunk by one. Three more ships were sunk by the Japanese flotillas after dark. Because of the hopeless position of the Russian fleet from the start, an important lesson of the battle was disregarded by most Western navies, as it had been, for the same reason, after the Yalu and Santiago—that a fleet with a decided fire superiority can destroy that of an enemy without suffering more than negligible damage itself.

At the first meeting of battle fleets in modern conditions, which included the use of wireless, Tsushima was an epoch-making event. Within a few years, however, in the very early stage of the Dreadnought era, a much more significant event occurred. It passed almost without notice.

7

The effect of the first ironclads upon the future of the capital ship was immediate. There could be no question of mingling wooden ships of the line and armoured vessels in the same battle fleet, and the former were obviously doomed. The beginnings of a second revolution in naval warfare went unrecognized at the time, and its development was a gradual process.

The first man to fly an aircraft from a ship was an American named Eugene Ely. This was in 1910; Ely's machine was a primitive affair of the box-kite type, and he took off from a platform rigged up on the forecastle of the anchored United States cruiser *Birmingham*. After almost touching the water with his tricycle undercarriage he landed on shore. The next year Ely

landed on a much longer platform fitted over the stern of the battleship *Pennsylvania*, and took off from it again.* In spite of what in every sense was this flying start, the Americans' progress in naval aviation lagged, because they continued to think of it in terms of wheeled land-planes. Only one other navy appears to have taken any interest in Ely's experiments; the British carried out similar trials, flying aircraft from platforms on battleships and in 1913 giving the old cruiser *Hermes* a flying-deck forward. But the Naval Air Service, then a wing of the new Royal Flying Corps, saw no future for wheeled aircraft at sea, since they could only take off from these short improvised flight decks—they could not land on them again. Had it been possible to fit warships with much longer decks, landing on them when a vessel was under way, and in all sorts of weather, was impracticable with the still primitive machines of the period. Naval airmen, accordingly, turned their attention to seaplanes. These could be hoisted out of a ship by cranes, and hoisted on board again, and for offensive purposes at sea they had the great advantage over land planes, which then could carry only light bombs, that they could launch torpedoes, much more deadly weapons against armoured ships.

This idea was still in embryo when war with Germany began in 1914. The *Hermes* was torpedoed that year. The navy, however, a bare month before the outbreak of war, had acquired its own air service, and the Admiralty took over for its use as seaplane carriers half a dozen Channel and Irish packet boats. Each carried four or five seaplanes. From three of these stout little ships Cuxhaven and Wilhelmshaven were bombed on Christmas Day, and in 1915 the *Ben-My-Chree* made the first torpedo attacks from the air on merchantmen in the Aegean. The Channel steamer *Engadine* was with the Grand Fleet at Jutland, where the fleet's wireless signalling system, which did not distinguish itself in that battle, failed to transmit to Admiral Beatty a seaplane pilot's report that he had sighted hostile ships, the first successful reconnaissance of this kind being in consequence dismissed by the navy as 'poor scouting'. †

* B. J. Hurren, *Perchance: A Short History of British Naval Aviation* (Nicholson and Watson, 1949).

† Captain Donald MacIntyre, *Jutland*.

By the end of 1914 the navy also had its first ship designed by thorough conversion as a seaplane carrier. Laid down as a tanker she was the second *Ark Royal.* Her historic name being wanted for our first big fleet carrier, she was renamed *Pegasus.* A more notable piece of conversion was that of the Cunard liner *Campania.* Her ten seaplanes took off from a forward flight deck on wheels, dropped when the planes were airborne. The *Campania* should have been present at Jutland, where she might have done valuable service.

To take the story of the aircraft carrier to the end of the war, by then the navy had another four ready, or nearly ready. The *Argus* and a second *Hermes* were the first to be built with fully flush decks, a necessary evolution carried so far in the *Argus* that her engine-room exhaust was led out from the stern, and the absence of any structure above deck level made the conning of the ship very difficult. From her hideous appearance she was known as the 'Flat-Iron'. The familiar 'island', funnel and navigating platforms set on one side of the flight-deck, was introduced on the new *Hermes* and *Eagle,* the latter a converted battleship ordered for the Chilian navy. These three carriers were the first designed to launch and take on wheeled aircraft. The small *Hermes* carried twelve to fifteen, the *Eagle,* of more than twice her tonnage, only twenty-one.

At this time, early in 1917, the Admiralty had on its hands three enormous cruisers which it did not know what to do with. The 'Outrageous', 'Curious' and 'Spurious', as they were known in the navy, were offspring of Lord Fisher's sometimes too fertile mind. Of shallow draught, nearly eight hundred feet long, with a speed of thirty-one knots, almost without armour but carrying very heavy guns, they were designed for Fisher's pet scheme of operations in the Baltic. With Fisher's resignation no more was heard about the Baltic; and to make use of the cruisers, which were unfitted for conditions of warfare in the North Sea, and probably anywhere else, they were turned into aircraft carriers. The *Courageous* and *Glorious* being ready for service, they were laid aside while the *Furious,* nearing completion, underwent conversion. This had to be a compromise, as she retained her original superstructure from the bridge aft: she was given a landing-on deck forward and a covered flying-off deck astern at a lower

level, the deck being an extension of one of her two hangars. As a carrier the *Furious* had a displacement of 22,450 tons and a speed of thirty knots, and carried thirty-two aircraft.

None of these three ships, the first carriers of the modern type, was completed in time to fly off aircraft in action in that war. No other navy, however, had any, and the *Courageous* and *Glorious* being converted in the 1920s, the Royal Navy started with a big lead in the carrier class. No more were added until 1936, when a new *Ark Royal* was begun. Then, under the threat of a second war with Germany, the naval estimates for that year included the provision of another six carriers; but when the war came six of the old originals, with the *Ark Royal*, made up our carrier force.

By the spring of 1945 only two of these veterans survived. Four had been sunk. The *Argus*, though she had seen active service, had reverted to her normal employment as a training ship. The *Furious*, worn out, was withdrawn from service two days before Hitler died. She and her sister-ships had been difficult to handle, having no weight to compensate for the big guns they had carried as cruisers, and she had undergone several major reconstructions; but to a busy and honourable career in the Second World War she could add a unique distinction. Not only did she link this Second War with the First, having taken on her aircraft before that ended, but she lived to witness the fullness of the second revolution in naval warfare, the final supersession of the heavily gunned ship, which had ruled the seas for more than four centuries, by the entirely novel type she represented.

Reconstructions could not give the *Furious* the functional form of later models of her class, built as aircraft carriers from the keel upwards, but the ungainly results of conversion were a reminder of her origin; and to look backwards in time from the squat 'island' she had acquired amidships to the 18-inch guns of her youth is to obtain a view of the naval scene as it had been then in something like its true perspective.

CHAPTER TWENTY

Jutland: The Anti-climax

1

THE creation of a new German navy at the beginning of this century was a remarkable achievement. Germany was a military power whose army, inheriting traditions from the Prussia of Frederick the Great, had become the most powerful in the world. The nation had no naval traditions. In challenging the maritime supremacy of Britain the Germans planned with their customary thoroughness, the new ships being designed to meet special needs and functions. In the middle of this process the whole fleet, built and building, was rendered obsolescent, if not obsolete, by the *Dreadnought*. The Germans took breath, and started again.

Their own Dreadnoughts and battle cruisers, like their predecessors, were designed for a limited role. A German fleet would operate very largely if not wholly in the North Sea. Based on its main naval ports, where there were barracks for the ships' crews, it would be at sea for very short periods, during which the men could put up with discomforts that would become intolerable if prolonged. The ships, accordingly, could afford to be elaborately sub-divided, whereas in British ships, which might have to go anywhere, or be in constant readiness in an ill-equipped anchorage to raise steam at a few hours' notice, sub-divisions were restricted to allow for reasonable mess deck and to minimize the number of vertical ladders. It was this inconvenient feature, almost as much as their better armour protection, that kept German ships afloat after punishment that would have sunk British ships of the same class. Better protection, however, was obtained at the expense of fire power, the guns of German capital ships being often of lower calibre and therefore lighter—the 11-inch was popular—and sometimes fewer in number, than British ordnance. A good deal of this extra protection went on horizontal armour. The red flash of a hit on a ship's side armour may raise a cheer, but probably the explosion of the shell has done only superficial

damage; at ranges of twelve or so miles it is the shell falling from a great height, penetrating the horizontal armour, and bursting in the ship's vitals, that may well decide a battle.

Through starting a navy almost from scratch, the Germans gained another advantage. They built dry docks to fit the design of their capital ships, whose width of beam made them very stable gun platforms. The beam of British ships of the largest type was limited by the width of existing docks. The widening of the Kiel Canal enabled the biggest German Dreadnoughts to use the Baltic as a training ground, the Russian Baltic Fleet being easily kept under control.

The Germans did not hope to equal the strength of the Royal Navy. Their aim was to build up a fleet sufficiently powerful to keep the main British fleet concentrated. Though it did not attempt the close blockade they seriously expected, it still had to remain in constant readiness in its bleak northern anchorage while their own lay snug in port, with every dockyard facility at hand. Opportunities might occur or might be engineered for a stroke at a detachment of the Grand Fleet, or at the battle cruisers based further south. In the meantime war against commerce was to be carried on by cruisers and submarines. These activities in a book on the capital ship, can be referred to only incidentally. Like the British, the Germans put too much faith in the torpedo as a weapon against fast, manoeuvrable ships; but the British navy was taught a needed lesson at the start of the war by the sinking of the three cruisers *Cressy*, *Hogue* and *Aboukir*. Pearl Harbor scarcely roused a louder howl of indignation, but the days of gentlemanly wars were over. The mine, however, was to prove a greater danger to surface warships than the torpedo.

An unpleasant surprise to the British was the excellence of German gunnery, due partly to superior optical instruments, and the high state of efficiency and morale in the High Seas Fleet—at any rate, until morale was sapped by the long months of inactivity in port after Jutland. Before Jutland, as new battleships were added, there was always expectancy of action, though for nearly two years the Fleet seldom ventured far outside the Heligoland Bight. Tip-and-run raids by the battle cruisers were the sum of its offensive action. In that which led to an engagement off the Dogger Bank with Admiral Beatty's battle cruiser

force from Rosyth the Germans were taught a valuable lesson. Inadequate protection for magazines against plunging fire was a defect in the original designs of this class of ship in both fleets, and one of Admiral Hipper's battle cruisers was nearly lost when the flash from a shell exploding in a turret passed down the trunk to the handling room far below, next to the magazine. The Germans profited by this warning, fitting flash doors which opened only for the passage of shells and charges to the hoists. Britain was to learn the same lesson more disastrously at Jutland.

It was with the advent of Admiral Scheer as Commander-in-Chief of the High Seas Fleet that a more enterprising policy was adopted.

2

At the end of May 1916, that fleet was assembled in full strength in the Schillig Roads, at the mouth of the River Jade. About 5 p.m. on the 30th an intercepted signal from the fleet flagship, the *Friedrich der Grosse*, was partially decoded at the Admiralty. Made to all ships, it appeared to indicate that an important operation was due to begin next day. The Grand Fleet, accordingly, was ordered to put to sea. This was a familiar routine proceeding, and before midnight twenty-eight Dreadnoughts and super-Dreadnoughts, nine battle cruisers, seven squadrons of heavy and light cruisers and a swarm of destroyers were steaming eastward from the Orkneys, Cromarty Firth and the Firth of Forth. With Admiral Beatty's Battle Cruiser Fleet—six battle cruisers and the 5th Battle Squadron of fast super-Dreadnoughts, with attendant light craft—was the seaplane carrier *Engadine*. A hitch had already occurred; the *Campania*, with her ten seaplanes, was anchored several miles from the main fleet at Scapa Flow, and she did not receive the sailing signal for some hours.

Beatty steered from the Forth for a point more than a hundred miles from the Danish coast at which he was to turn north to meet Admiral Jellicoe's battle squadrons coming down from the Orkneys. This again was an operation often performed during sweeps made by the Grand Fleet, and by dawn on the 31st it appeared that the combined movement would end as others had done, with the whole mass of ships returning to their bases after

a vain parade of power. There had been another hitch, this time at the Admiralty. The High Seas Fleet had begun to leave the Schillig Roads at 1 a.m., but Admiral Scheer had transferred his flagship's wireless call-sign to a signalling station on shore, and though this was the usual practice when the fleet put to sea, the Admiralty's interception service took the ruse at its face value. Admiral Jellicoe was informed that the German flagship had not left the Jade.

Scheer, with sixteen ships of the Dreadnought class, had no intention of pitting them against Jellicoe's twenty-eight; but when he planned another raid for this month of May, his battle fleet was to come out in support. He hoped to trap the British battle cruisers, and possibly a detachment of the Grand Fleet hurried south to deal with the raiders. The bombardment of defenceless seaside towns had roused public feeling in England, and Jellicoe was under pressure to do something about it.

Features of the original plan were the use of submarines to lie in wait off the Grand Fleet's bases, and of Zeppelins to report its movements. The submarines took up their stations in the middle of May, but to the end of the month thick weather kept the Zeppelins in their sheds. From day to day the operation was postponed; without air scouting Scheer was blind, and he dared not take his battleships far out into the North Sea when for all he knew the Grand Fleet might also be out on one of its sweeps. In the end, as the submarines could not remain on patrol after the 31st, he was forced to adopt an alternative and less ambitious plan. Admiral Hipper's five battle cruisers, again with the main fleet in support, were to run north up the Danish coast to the Skagerrak. This move would bring an immediate response from the British Battle Cruiser Fleet at Rosyth, and it might find itself under the guns of German Dreadnoughts before the Grand Fleet could reach the scene from Scapa Flow.

This, in fact, was the situation apparently developing when, at 2.15 p.m. on the 31st, Beatty's flagship, the *Lion*, made a signal by flags for the northward turn. Hipper was then only some twenty miles to the eastward, and the turn brought the opposing battle cruisers on converging courses. Scheer's sixteen Dreadnoughts, with six pre-Dreadnought battleships in company, were some forty miles astern of Hipper. The Germans were then un-

aware that their wireless signals were being read, if imperfectly, and Scheer had no notion that the Grand Fleet was on its way to meet him. At 2.15 p.m., however, it was still sixty-five miles to the north-west of the battle cruiser forces. Equally unconscious of the High Seas Fleet's approach, it was steaming in its cruising formation at fifteen knots, its actual progress reduced by zig-zagging in case hostile submarines were about.

British signalling errors were a prominent factor in the conduct of the Battle of Jutland. Beatty's 5th Battle Squadron, ordered to take station five miles astern of the battle cruisers, could not read his signal for the turn to the north, and it lost another mile on the wrong course before the signal was repeated by search-light. The battle cruisers had increased speed to twenty-four knots, and by the time the Battle Squadron had worked up to this it was ten miles astern. By then the scouting screens of the two battle cruiser forces were in touch, and Beatty again altered course to the north-east. At 3.20 p.m. his tripod masts were in sight from Hipper's flagship, the *Lützow*.

The thick weather had cleared, too late for the Zeppelins to overtake the German fleet, and the sea was calm; but by three o'clock the eastern horizon was misty. When the battle cruisers opened fire at 3.45 p.m. at about sixteen thousand yards, visibility favoured the Germans. The British gunnery control, its optical instruments much inferior to the enemy's in hazy conditions, at first greatly overestimated the range, and it was further hampered by funnel smoke from destroyers racing to get ahead on the big ships' engaged side. The *Lion*, leading the line, and two others had been hit several times before the range was corrected, and then again a failure of flag signalling worked to the enemy's advantage. Hipper had only five battle cruisers to Beatty's six, but for ten minutes the latter's fire was wrongly distributed, the *Derfflinger*, second in the German line, escaping attention.

Hipper, in fact, had all the best of this stage of the engagement. Though the range was down to thirteen thousand yards, his ships had hardly suffered at all. At four o'clock, however, he turned away, steering south-east to draw Beatty towards the German battle fleet. Beatty also turned away, heading south, and the range lengthened. Both flagships were badly hit about this time, and the duel between the two rearmost ships in the respective lines,

the *Indefatigable* and the *Von der Tann*, was ended by two salvoes which crashed through the *Indefatigable*'s deck and exploded a magazine. In a fearful outburst of smoke and flame she went down.

It was only now that the 5th Battle Squadron, doing its utmost to overtake the battle cruisers, saw the enemy's ships dimly through the smoke and mist. Turning on a parallel course, it opened fire at nineteen thousand yards, just as Beatty, his flagship's crew fighting cordite fires, again turned away out of range and ordered a destroyer attack to ease the pressure. The Battle Squadron's fire was described by the Germans as magnificent, and almost at once the *Von der Tann* and *Moltke* were severely damaged by 15-inch shells.

Beatty was in action again within a quarter of an hour. At 4.26 p.m. the *Queen Mary*, engaged by two battle cruisers, blew up as the *Indefatigable* had done, her back broken by magazine explosions. Hipper, however, was now under overwhelming fire from the 5th Battle Squadron. As he sheered away, his torpedo-boats dashed forward to attack it; there was a fierce action in a smother of funnel smoke and shell splashes midway between the main fleets until, at 4.43 p.m., Beatty recalled his destroyers. He was leading the Battle Cruiser Fleet round on to a northerly course. The flagship had received a startling signal. The enemy's battle fleet had been sighted just over the horizon.

3

By two forty-five that afternoon Admiral Jellicoe had learnt that what he had feared would be another abortive sweep had taken a happy turn. Soon after Beatty reported that his scouting cruisers were in touch with the enemy's light craft, news came that the former could see heavy smoke to the southward—the smoke of Hipper's battle cruisers. The Grand Fleet, still in its cruising order, six columns, each of four battleships, disposed abeam, stopped its wasteful zig-zagging and raised speed to seventeen, eighteen and then nineteen knots. Well ahead on its port bow were three battle cruisers under Admiral Hood. Its light cruiser squadrons pressed forward at high speed. One valuable ship was still missing; when at length the *Campania* received the sailing

signal and put to sea, she was so far behind the fleet that the Commander-in-Chief, rather than let her try to overtake it unescorted, ordered her back to her anchorage.

Soon after 4.30 p.m., when Beatty's and Hipper's destroyers were clashing together, the former's cruisers and those of the Grand Fleet were in visual contact. Commodore Goodenough's light cruiser squadron was visible four miles ahead of the *Lion*, and immediately afterwards the Commodore saw a remarkable spectacle—the masts of battleships coming up over the southern horizon. He pushed on until he was under fire from the High Seas Fleet. At this important juncture visibility to the south had improved, and Beatty, after getting Goodenough's signal, caught a glimpse of the head of the long line of German battleships, thirteen miles away, before he turned north-west to meet the Grand Fleet. Admiral Hipper, his battle cruisers badly hammered by the 5th Battle Squadron, was also hauling round to the north.

No one on the bridge of the *Lion* appears to have thought of conveying orders or even information to the 5th Battle Squadron, still eight miles astern. Accordingly it kept on its southerly course until the battle cruisers were tearing past, when it was ordered by signal to alter course a hundred and eighty degrees in succession. While doing so, it came under fire from the leading battleships of the High Seas Fleet. Concentrated on the turning point, this fire inflicted considerable damage, which the squadron might have been spared had the order been for its four ships to turn together instead of in succession.

In the meantime, the news so often and vainly hoped for, that a fleet action was imminent, had reached Admiral Jellicoe. It had barely done so when the Admiralty, rather late in the day, corrected its statement that the High Seas Fleet was still in port, and gave its estimated position at 4.09 p.m. What, however, Jellicoe could not discover was that position an hour later in relation to his own. As it happened, navigational miscalculations on his flagship, the *Iron Duke*, and on the *Lion*, had thrown him out in his reckoning, and after five o'clock, when the German battle squadrons were lost to sight in the haze again gathering to the south and east, for another hour only scrappy and confusing news of the battle cruiser forces came through. Admiral Hood's

three battle cruisers had been sent south-south-east at twenty-five knots to join Admiral Beatty, but the latter was then twenty miles to the westward on his northerly course.

Just before six, however, when his force was again engaging Admiral Hipper's, it came within sight of the right wing columns of the Grand Fleet. As it was an hour since Beatty had seen the High Seas Fleet, he had no answer to the anxious inquiry by search-light, 'Where is the enemy's battle fleet?' Even Hipper was now lost to view in the smoke and haze. But at 6.14 p.m., when the *Lion* was tearing across the front of the six columns of battleships, to take station ahead, she flashed the message that the enemy's battle fleet was in sight on a south-west bearing.

It was much nearer than Admiral Jellicoe had supposed. His own fleet was still steaming in its cruising formation at twenty knots. The old German battleships limited Admiral Scheer's speed, but the two fleets were rushing together at a combined speed of thirty-five knots, and Jellicoe had still to decide whether to deploy into line to port or starboard. At 6.15 p.m. deployment was ordered on the port column. The leading ship of each column turned to port, the three others following in succession, and within twenty minutes the twenty-four battleships were in line ahead. As, however, the fleet had been steering south-west, but was now given a more southerly course to correspond with the bearing of the enemy's fleet, the line, while forming, made an obtuse angle round the turning-point. Beatty was still crossing the chord of the angle. The 5th Battle Squadron, whose place was also in the van, was so far astern of the battle cruisers that it turned to port to fall in at the rear of the line.

Admiral Jellicoe's surprise at finding the High Seas Fleet so near was nothing to the shock that awaited his adversary. Having no news from his submarines off Scapa Flow, Scheer had convinced himself that there was nothing in front of him but the Battle Cruiser Fleet from the Forth, and at five o'clock he ordered a general chase. His battle squadrons were in line ahead, steering north-east, when at 6.30 p.m., to the horror of Admiral Behncke, leading in the *König*, an endless line of great ships loomed dimly in view, curving round and crossing his 'T'. His leading squadron, and Hipper's battle cruisers ahead of it, came under a punishing fire at fourteen thousand yards.

The battle cruisers were already under fire from those of Admiral Hood, coming from the north-east. Between the main fleets, light cruisers and destroyers were in action, and Hood steered for the gun-fire. His 12-inch guns disabled the *Wiesbaden*. At this juncture Admiral Arbuthnot impetuously led his squadron of four heavy cruisers into the mêlée at high speed. He gave the defenceless *Wiesbaden* a further battering in passing, came under the guns of the leading German battleships, and met with disaster. His flagship, the *Defence*, blew up; the *Black Prince*, badly injured, fell astern of the fleet and was lost to sight and knowledge; the *Warrior*, down by the bows and on fire, was saved from immediate destruction by a turn to the westward that brought her near the 5th Battle Squadron at the moment when the helm of the battleship *Warspite* jammed. The *Warspite* made two complete circles round the burning cruiser, drawing the enemy's fire. Both ships were ordered to make for port, the *Warrior* being taken in tow by the seaplane carrier *Engadine*, which might have been more usefully employed. The *Warrior* had later to be abandoned. A more terrible fate had by then befallen the missing *Black Prince*; about midnight she ran into the High Seas Fleet making its escape through the British destroyer flotillas, and in a blaze of searchlights was torn asunder as the *Defence* had been.

The afternoon's tale of calamities did not end with the virtual destruction of the 1st Cruiser Squadron. Hipper's battle cruisers were suffering dreadfully from Admiral Hood's fire. The *Lützow*'s upper works were a mass of wreckage, and she was ablaze. But she was fighting back, and she and the *Konig* concentrating their fire on the *Invincible*, literally rent her in two with a salvo that exploded her magazines.

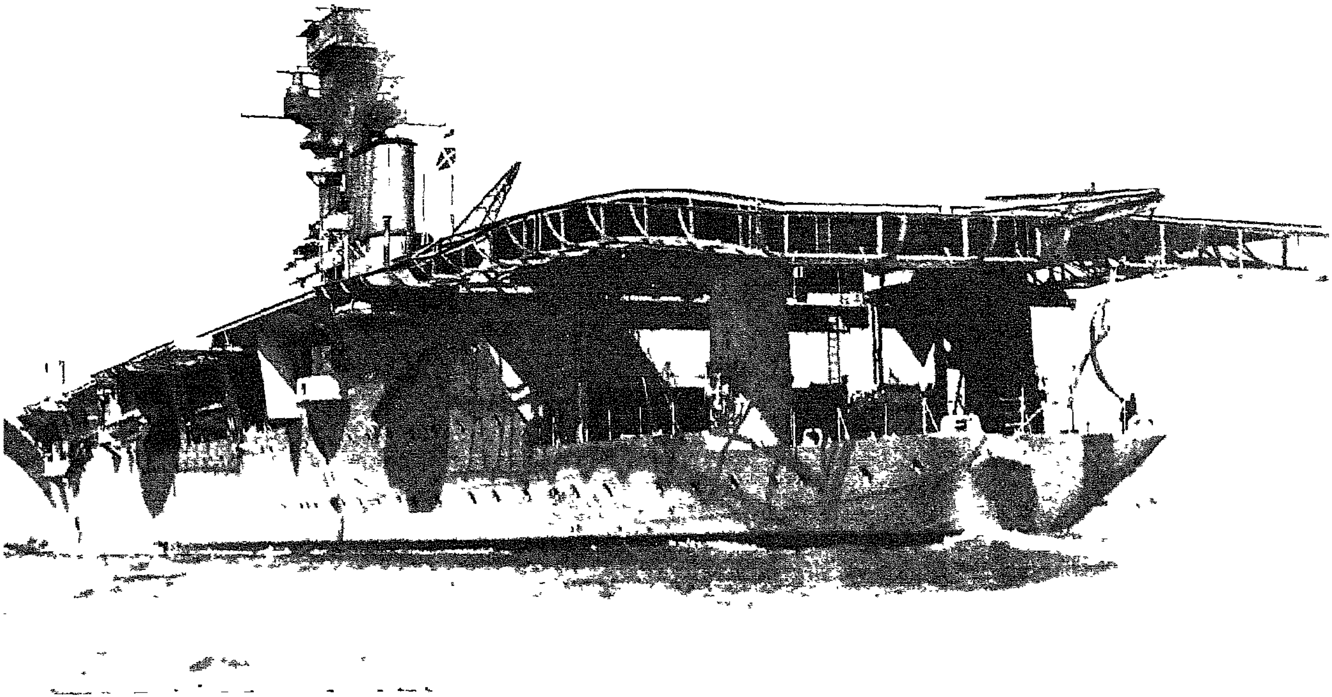
All this, however, was of no avail to Admiral Scheer, who had run headlong into a trap. From both ends of the curving line of British battleships a rain of shells fell upon his leading ships. At 6.35 p.m., accordingly, he ordered a manoeuvre often practised by the High Seas Fleet, the German portmanteau-word for which means 'Battle Turn-away'. While destroyers and torpedo-boats dashed forward and laid a smoke screen, the twenty-two battleships, whose line the general chase had somewhat disordered, turned away together a hundred and eighty degrees to starboard.

Hipper's battle cruisers also turned about, the *Lützow*, crippled and settling in the water, falling astern. In a few minutes, from the British line nothing could be seen to the west but smoke and mist, and firing ceased.

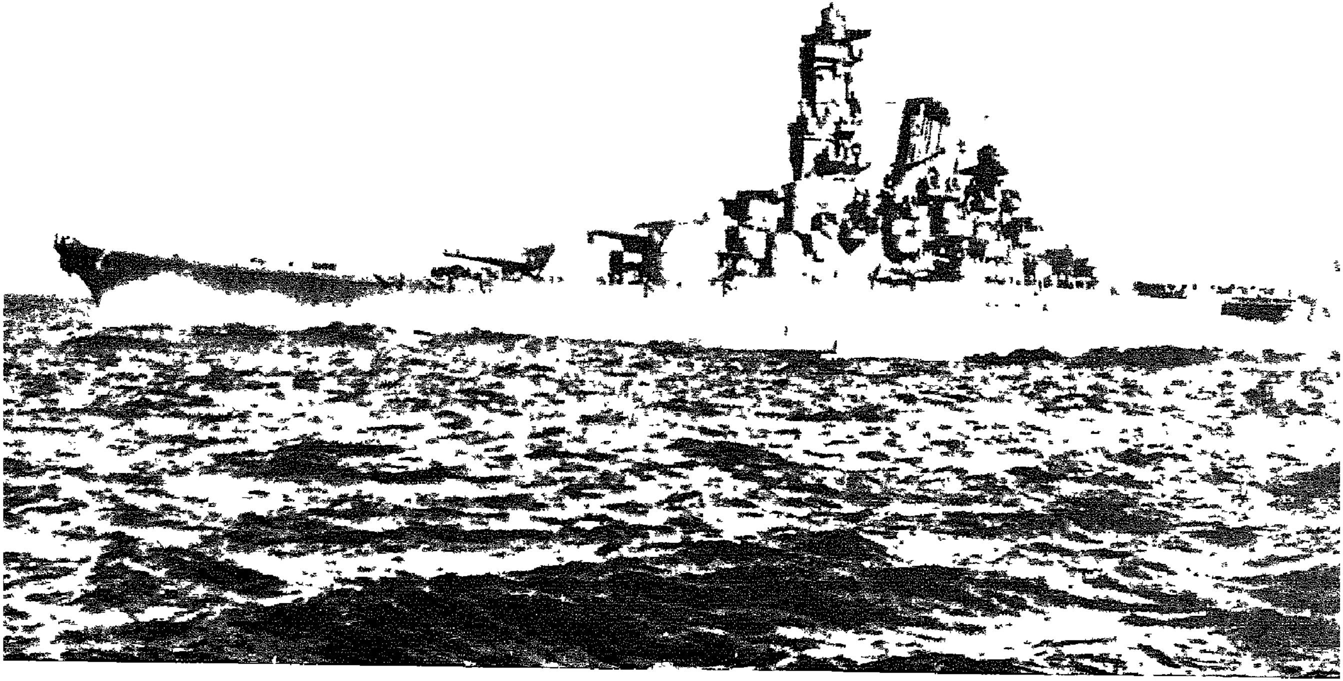
Scheer's turn away could only be temporary. His one thought now was to escape, to get back to the Jade, and he was steaming away from it. Just before seven o'clock he turned about again. He assumed that the Grand Fleet was in pursuit, and he hoped to pass astern of it by heading for the most northerly of the three channels through the German minefields, from which he could turn for home behind the shelter of Horns Reef, off the Jutland coast. Jellicoe, however, appears to have taken the smoke screen for nothing more than a thickening of the mist; supposing that the German fleet was heading south-west, he had altered course to the south by divisions. Scheer again ran into the tail of the Grand Fleet, and again had to execute a Battle Turn-away, sending the badly hammered battle cruisers forward on what the Germans, with their bent for heroics, term a 'death ride'. Behind the battle cruisers came torpedo-boats, laying another smoke screen.

This time the turn away was clearly visible from the British battle line. Jellicoe, who greatly overestimated the danger from torpedoes, had determined, and had so informed the Admiralty, that if the German fleet turned away he would not follow in its wake, because the flying enemy would discharge torpedoes and drop mines. In the event of a destroyer attack, which was now also taking place, he himself would turn away. He took action accordingly; the Grand Fleet turned away forty-five degrees, and the two fleets were now steaming in opposite directions. In a minute the High Seas Fleet was out of sight, and to all intents and purposes the Battle of Jutland was over.

When the Grand Fleet resumed its southerly course there was only an hour and a half of daylight left, and very poor daylight at that. Jellicoe had made up his mind that Scheer was also steering south, and must soon make another attempt to break through. Nothing, however, had happened when darkness fell and the Grand Fleet resumed its night cruising formation at seventeen knots. Scheer had in fact resumed his course for Horns Reef, but at sixteen knots, so that when, about 11 p.m., he did make his third attempt to break through it was successful beyond



H M S *Hermes*, 1919 The second aircraft carrier of this name, she was sunk by Japanese carrier-borne aircraft in the Indian Ocean, 1942



Japanese battleship *Yamato*, 1941 The *Yamato* and the *Musashi* were the biggest battleships in the world

his wildest hopes. He passed astern of the Grand Fleet, still happily keeping its south-easterly course, brushed aside a number of very gallant attacks by destroyer flotillas, sank several destroyers and the luckless *Black Prince*, lost the pre-Dreadnought *Pommern*, one of the very few victims of the hundreds of torpedoes fired that day, and by dawn was off the Horns Reef, and safe. The Grand Fleet, which in default of the information that should have reached Admiral Jellicoe, had ignored the sounds of combat astern, the gun-flashes and the searchlights, was still steaming serenely in the wrong direction.*

4

To the general historian the Battle of Jutland may rank as decisive, because after it the High Seas Fleet never again ventured within reach. To the British public it came as a bitter disappointment. Though in greatly superior force, we had lost three battle cruisers and three armoured cruisers; the Germans had one old battleship, one battle cruiser (the *Lützow*) and four light cruisers sunk. It was not known until after the war that in spite of defective shells the High Seas Fleet was so battered that seventeen ships, including three of the four surviving battle cruisers, were under repair for many months. Only seven British ships above the destroyer class required major repairs. But such comparisons, could they have been made at the time, would not have redressed the adverse balance, nor, in the navy, the consciousness of failure and the realization that it was due in part to shortcomings in training, in the design of our ships and armament, and in the structure of command.

Admiral Jellicoe was an organizer, a man of a rigid and authoritative type of mind, 'saturated in discipline', in Lord Fisher's words. He did not believe in delegating power, and his subordinate commanders were unaccustomed to thinking or acting for themselves. They looked to the fleet flagship for orders, and whatever the circumstances took these literally, as had already been clearly shown in the Dogger Bank action, when unthinking obedience to a misunderstood signal enabled Hipper's

* Julian Corbett, *History of the Great War: Naval Operations*, Vol. 3 (Longmans, 1940).

battle cruisers to escape. Jellicoe's organizing gifts had worked up the Grand Fleet to a high pitch of efficiency, but there were gaps in this training and a very unfortunate one recoiled upon the admiral himself—he could get little news of the course of the battle because his subordinates had not been taught the importance of transmitting information. When they did, the signalling service in the fleet was often at fault. At the same time, the admiral's rigid type of mind, once it was made up, could not be deflected. It is still difficult to understand how Jellicoe and his staff, during the night of the battle, could ignore, apparently without serious inquiry, the gun-fire and searchlights astern; presumably, it having been decided, quite wrongly, what the High Seas Fleet was doing, admiral and staff refused to be diverted by noises off. Here Jellicoe suffered again from lack of information which he could and should have received. The 5th Battle Squadron, well astern of the main body, actually saw German battleships, but did not report them. Finally, he himself was naturally a cautious man, and the immense load of responsibility weighing upon him made him over-cautious, as in the case of his exaggerated fear of torpedoes.

The use, or misuse, of the 5th Battle Squadron, the four newest and fastest super-Dreadnoughts, seems to be a blemish on the conduct of the battle itself, for which Admiral Beatty shared responsibility. On the other hand, it appears that he was unjustly accused of neglecting gunnery training in the Battle Cruiser Fleet. Its gunnery was good, once the initial errors of range-finding were corrected; it was the shells that went wrong. Too often they broke up on hitting armour obliquely. The defects in the design of the battle cruisers were learnt at terrible cost. After Jutland the magazines of the survivors were given better protection; yet the old fault of inadequate horizontal armour was repeated in the gigantic *Hood*, completed just too late to take part in this war. Attention was drawn to this weakness, but she was never given the extra armour promised, and in the next war she met the same end, for the same reason, as the *Indefatigable*, the *Invincible* and the *Queen Mary*.

An unhappy sequel to Jutland was a prolonged and acrimonious controversy in the British service, echoes of which can be heard today. To another professional class, all over the world,

the battle must soon have appeared an anti-climax of frustration. For fifty years naval architects had devoted their skill to the development of the ironclad, in particular to that winner of battles, the capital ship. With the super-Dreadnoughts of the First World War this class seemed to have reached its acme; minor touches would no doubt be added, but here, at last, was the battleship of the future. Counting battle cruisers, nearly sixty of these great ships met at Jutland—and to what end? During the main fleets' few brief encounters in mist and smoke many ships never saw an enemy—only gun flashes in the murk. What was to have been the climax of the war at sea was a partial and inconclusive engagement; and it was the finish, as a winner of victories, of the orthodox battleship. The next war was to be dominated by a type of warship scarcely given serious consideration in 1916.

5

During most of the last years of the battleship, as the term had been understood for more than four centuries, displacement was limited in theory by international treaties. Such restrictions could not be enforced. While other powers made do with greatly reduced fleets of existing ships, some already elderly, Germany had none at all when she started rebuilding and could design the most up-to-date models; and under Hitler's rule the published figures for her major warships fell far below their true displacement. The 42,000-ton *Tirpitz* (officially of 35,000 tons), surviving her sister ship by three years, was the biggest capital ship in the world until the launching of the U.S.S. *Missouri* and the enormous Japanese *Yamato* and *Musashi*.

The twenty years between the two World Wars was a period of new requirements and new inventions. While what was left of the old British navy underwent a constant process of modernization seven battleships were laid down, but five of them not until 1937. A feature of all seven was the mounting of the heavy guns in what were ungrammatically called triple and quadruple turrets. The 1937 class, which included the *Prince of Wales*, carried four 14-inch guns of a new type in each of two turrets, and two in a third superposed forward. The secondary battery had come back

with the first super-Dreadnoughts, to deal with the new large type of destroyer; and to this was now added an increasing array of anti-aircraft weapons. The sixteen 5·25-inch guns of the *Prince of Wales* and her sisters, with sixty degrees elevation, could supplement the fire of sixty 2-pr. A.A. guns and Bofors and Oerlikons wherever room could be found for them. As in all navies guns continued to improve and ranges to grow longer, the big turret guns were themselves given increased elevation; and the Japanese were to use them against aircraft, endeavouring to disrupt formations by the violent explosions of the huge shells in the air. The British wire-wound guns were replaced by an all-steel design when greatly improved new steels were adopted in the 1920s. In small classes of ships electric welding began to replace riveting. The Germans also employed this method, but were over-ambitious; their pocket battleships were all-welded vessels, and when the *Graf Spee* took refuge at Montevideo her plating was cracked by the concussion of her own guns.

Where British scientists led the world was in the development of radar. In its infancy in 1939, and regarded as a form of air warning, by 1941 the navy was being fitted with sets for detecting ships. The resulting contribution to the navy's efficiency, it has been said, 'cannot be overstated'.*

6

When war came again, the main roles of the one-time battle-winner, the capital ship, were commerce raiding and protection and the task of covering invasion by fire power. Japan and America had considerable battle fleets, but they never met as such. The German naval command, to whom the war came prematurely, was resigned from the first to employing its few capital ships in the general *guerre de course*. After the collapse of France, and the tragic affairs of Oran and Dakar, in which British battleships were engaged, the entry of Italy into the war led to hopes of better things in the Mediterranean; but the Italian fleet could never be brought to action. Three veterans of the 5th Battle Squadron at Jutland at least enjoyed a rare experience when, radar having guided them undetected to a pair of

* A. J. Sims, 'Warships: 1860–1960'.

heavy Italian cruisers steaming innocently through the night to the aid of a disabled consort, their guns trained fore and aft, 15-inch shells blew them to pieces before they could fire a shot.

In the less dignified part of a threat to commerce, the battleship exerted its strategic power almost to the end. The mere existence of the *Tirpitz*, lurking in Norwegian fiords, compelled the Home Fleet to keep two or three ships of her class and an aircraft carrier for three years in northern waters, to guard the convoys to Russia. But for the *Tirpitz*, the *Prince of Wales* and *Repulse* might not have been lost off the coast of Malaya; a carrier should have been with them, but when they sailed for Singapore the sinking of the *Ark Royal* and minor mishaps left only one carrier available, and she could not be spared from the watch kept over the German battleship.

By then, three days after Pearl Harbor, the world knew that a entirely new turn had been given to naval warfare. Only three navies were in varying degrees prepared for it, the British, the American and the Japanese. By 1939 the single French aircraft carrier was twenty years old. One building in a German yard was never completed. The Italian navy had none. In the British battle fleet there were then seven, only the *Ark Royal* being modern, but six more were nearing completion. There were six in the navy of the United States, and that of Japan had ten, and another five laid down. Efficient wireless transmission now kept carrier-borne aircraft in constant communication with their carriers over long distances.

British carriers were designed for operations in the relatively narrow European seas, where they would often be under attack by land-based aircraft. The six which followed the *Ark Royal* under the 1936–9 programme were accordingly given an armoured deck. Subdivision reduced aircraft accommodation to two enclosed hangars, and these ships carried only about half the complement of American and Japanese carriers of equivalent tonnage, which had one spacious hangar deck. The main function of British carriers, our immediate enemies having none, was protective—the guarding of naval forces and convoys against air attack from the land. The Royal Naval Air Service, only very lately freed from hampering subjection to the R.A.F., and for half the war starved of modern aircraft by the demands of the

bomber offensive, was, however, to have its more rewarding moments. Its obsolescent torpedo-bombers did invaluable work in the Mediterranean where they put three Italian battleships out of action at Taranto. Another from the *Ark Royal* ensured the destruction of the *Bismarck* by a hit on her rudder.

Though the American navy had an Atlantic Fleet, it looked westward, to the enormous spaces of the Pacific, with Japan as the potential enemy. Commanders of American battle fleets might still regard carriers as a secondary and protective arm, but carrier enthusiasts already envisaged battles between carrier forces acting independently, launching aircraft at one another over distances of a couple of hundred miles. And the Japanese navy had gone further; it was thinking of its carrier fleet as its main striking force. Until Sunday, 7 December 1941, it did not put all its money on carriers; it was still building battleships. But after Pearl Harbor it laid down no more. Nor did the United States' navy or any other, except for the solitary case of the *Vanguard*.

To see a conventional capital ship of this century it may soon be necessary to go to Yokohama, where Admiral Togo's *Mikasa*, once proudly preserved and then left in a backwater to rust, has been restored to her old status as a national monument, or to North Carolina, where the American battleship of that name, completed in 1941, is preserved at Wilmington as a war museum. The scene of the *Mikasa*'s survival is the more appropriate for it was events in the Pacific that ended the gun's long reign and with it that of the battleship itself. There the new warfare, with its own strategy and tactics, took the place of the old.

CHAPTER TWENTY-ONE

Epilogue: Midway

1

THERE has been some rather self-righteous thinking and talk about the attack on the American Pacific Fleet at Pearl Harbor. British and Americans alike tend to assume that their own way of doing things should be universal. It was an American general, Bedford Forrest, who said: 'Strategy is horse-sense; when practised by Indians it is called treachery.' To put the American Pacific Fleet out of action by the most rapid and effective means, which meant surprise, was horse-sense to the Japanese mind. The Americans should not have been surprised; they were dealing with Orientals, and twice before in recent times the Japanese had begun a war without a formal declaration. When they struck at Pearl Harbor they were repeating their methods at Port Arthur. The naval and military commanders at the American base had, moreover, been warned by Washington to be on their guard.

With the Pacific Fleet, or its battleship strength, out of the way, the Japanese could proceed at once with their ambitious war plan. The aim of this was to create a ring of defensive positions on islands deep in the Pacific, in the far south taking in the indispensable oil-bearing Dutch East Indies. The ring would be extended to include two vital strategic areas—the neighbourhood of Pearl Harbor, on Oahu in the Hawaiian group to the eastward, and in the south the Coral Sea, the direct route from America to Australia, on which continent an American army for a counter-offensive must be based.

The soldiers who controlled Japan's war policy seem to have thought this last precaution scarcely necessary. The naval officers who had to carry out the plan were more realistic. The commander-in-chief, Admiral Yamamoto, did not share the army's wishful thinking about a short war and a negotiated peace. He knew that American industry, in the long run, would leave Japanese naval construction standing still. Time must be gained to strengthen

the defensive ring against the inevitable counter-attack; and for this the first essential was the elimination of American naval power in the Pacific. Though not a carrier officer, Yamamoto was in advance of most naval thought of that time. He saw that because the aeroplane outranged the gun, the conventional capital ship had had its day; decisive battles would be fought by striking forces of carriers, shielded by conventional warships. Pearl Harbor was, in his view, only half a victory; it was not merely to leave a line of smoking wrecks in Battleship Row that he had planned the attack, and the three American carriers that should have been in port had escaped his stroke. With one more, they now formed the American battle fleet in the Pacific. Some old battleships at San Francisco were too slow to work with them. Upon these carriers, all big ships of their type, having between them three hundred and fifty aircraft, everything depended.

The *Saratoga* was being overhauled at San Diego, on the Californian coast, but the *Lexington*, *Enterprise* and *Yorktown*, which had been at sea when Pearl Harbor was attacked, were back there, or were somewhere near at hand. To entice them within reach of a superior force Yamamoto evolved a double programme, to be carried out in May 1942. From Rabaul, in New Britain, where the Japanese were creating a naval base, Invasion Groups were simultaneously to seize a small island, Tulagi, in the southern Solomons, for a seaplane base, and capture Port Moresby on the south coast of New Guinea. From these objectives, a thousand miles apart, the Coral Sea could be commanded and Australia directly threatened. Before the end of the month the main blow was to be launched against the other strategic area—the Hawaiian Islands. Yamamoto considered Pearl Harbor itself too remote and too hard a nut for an amphibious force to crack; but eleven hundred and thirty miles to the north-west it had an outpost on a small atoll half-way between California and China, and hence named Midway. Pearl Harbor could be almost neutralized by Japanese aircraft and submarines operating from Midway, and a threat to the island would inevitably bring the American carrier force to the rescue. For good measure Yamamoto added a diversionary attack in the extreme north, where in a ghastly climate the Aleutian Islands stretch from Alaska almost to Kamchatka. As they are a projection of

the American mainland, the seizure of one or two would have a moral effect out of proportion to their value.

2

Over-confidence and too rigid an adherence to a time-table endangered this complicated plan from the start. Operations in the Dutch East Indies and in the Indian Ocean had been brilliantly successful, but they left three-fourths of the Japanese carrier force in need of repairs and replacements of aircraft and aircrews. But timing must be kept, and when the double move southwards began in the first days of May, out of ten carriers only the big *Shokaku* and *Zuikaku* and the light carrier *Shoho* were ready for sea. Tulagi was occupied on 3 May, and on the 4th the Second Invasion Group was on its way to Port Moresby. A Covering Force, including the *Shoho*, and a Striking Force built round the *Shokaku* and *Zuikaku*, came down from Truk, the Japanese base in the Caroline Islands. Japanese security measures were poor, and Admiral Nimitz, in command at Pearl Harbor, had already learnt from decoded messages of intended operations in the Coral Sea. Admiral F. J. Fletcher, with the *Lexington* and *Yorktown*, was then near Samoa, in a position to take appropriate action; and after both sides had been fortunate to escape the results of misleading reports and misunderstandings, the first true carrier battles were fought on 7 and 8 May.

American and Japanese carriers were then the most vulnerable and inflammable ships that ever put to sea. Huge targets, full of oil, petrol and explosives, only their hanger decks were lightly armoured. The well-armoured flight decks of British carriers had proved their worth in the Mediterranean, and later in the Pacific were to defeat the Kamikazi suicide aircraft that sank or disabled a number of American carriers. These and the Japanese relied on their own guns and fighters and on the fire power of a protective screen of cruisers and destroyers. This form of defence never defeated a determined attack by aircraft in sufficient force.

Thus when on 7 May the Covering Force was discovered, the *Shoho*, with only two light cruisers and her nine fighters to protect her, was sunk in half an hour by a swarm of bombers from the *Lexington* and *Yorktown*, which altogether launched

ninety-three aircraft. This put an end to the threat to Port Moresby; the Second Invasion Group turned back. Admiral Takagi, commanding the Striking Force, with its two big carriers under Admiral Hara, was unaware of this; having entered the Coral Sea he was heading west at high speed, and on the morning of the 8th, when the opposing forces were nearly two hundred miles apart, each was sighted by the enemy's scouts. In the ensuing attacks American bombers left the *Shokaku* blazing and damaged the *Zuikaku*; the Japanese torpedo-bombers scored six hits on the *Lexington*. During the night explosions wrecked the American carrier, and she had to be abandoned. The *Shokaku* was with great difficulty got back to Truk.

Described as 'ever memorable as the first carrier-against-carrier naval battle in which all losses were inflicted by air action and no ship on either side sighted a surface enemy,'* the Battle of the Coral Sea first illustrated what was to be a common feature of carrier warfare—the tendency to overestimate the enemy's losses. The two striking forces brought the same happy news—both hostile carriers had been sunk or left sinking. This misleading report was to influence Admiral Yamamoto's plans for the capture of Midway.

3

Japanese code messages being again broken, by the middle of May Admiral Nimitz knew where and when the next blow would fall. In the last days of the month the *Enterprise*, *Yorktown* and the newly arrived *Hornet* left Pearl Harbor for a point in the ocean three hundred miles east-north-east of Midway. With cruisers and destroyers, the carriers formed the nuclei of two task forces. One was under Admiral Fletcher, in overall command on the *Yorktown*. The *Enterprise* and *Hornet* were in the second force under Admiral R. A. Spruance. Midway had been reinforced by marines, radar equipment and long-range bombers and fighters. The possession of radar at this stage of the naval war, Japanese ships being then without it, worked greatly to the Americans'

* S. E. Morison, *History of United States Naval Operations in World War II*, Vol. IV (O.U.P., 1949).

advantage. A small force was to go north to wait on events at the Aleutians.

The attack on Midway was known to be due in the first days of June, and a further correct forecast was that the enemy's main fleet, including several big carriers, would approach from the north-west. With so much of his plans known, or rightly anticipated, Admiral Yamamoto, who himself was later to be the victim of a decoded message, was happily counting on effecting a complete surprise. Believing the report that two American carriers had been sunk in the Coral Sea, he supposed that only the *Enterprise* and *Hornet* were left in the western Pacific. No doubt he wished that the *Saratoga*, still absent from that area, was there too, for he was going to strike in overwhelming force. It was virtually the whole Japanese navy that sailed in the last week of May from the Inland Sea and the Marianas to the south to take one small island—more than ninety surface ships, such an armada as had not been seen since the Grand Fleet made its sweeps from Scapa Flow. In command was Yamamoto himself, on the 72,000-ton *Yamato*, until the completion of her sister ship, *Musashi*, the biggest battleship in the world.

The great puzzle of the Midway operation is why this huge array was sent to sea if no offensive use was intended to be made of nine-tenths of it. The enormous fire power of the battleships and cruisers was not to be used to batter the island's defences and runways into ruin; this was work left to Admiral Nagumo, the victor of Pearl Harbor, with his four fleet carriers, the *Akagi*, *Kaga*, *Hiryu* and *Soryu*, whose aircraft should have been reserved for their true objective, the American carriers. It was to prove a fatal decision. The most probable theory put forward to explain Yamamoto's employment of so vast a supporting force is that he expected to capture Midway in a few hours, and then, counting on surprise, to lead his whole fleet to meet the American carriers, hurrying too late from Pearl Harbor.* Submarines had been sent ahead in ample time, on this supposition, to sight Admiral Fletcher's force *en route*.

The real situation was very different. While the submarines were still on their way, the two American task forces were already

* S. E. Morison, *History of United States Naval Operations in World War II*, Vol. IV.

making for the point in the open Pacific where they were to cruise in ambush. It was four hundred miles east of the spot from which Admiral Nagumo meant to launch his bombers. Long-range aircraft from Midway having sighted Japanese transports on 3 June, Fletcher and Spruance, looking to the north-west for the main Japanese fleet, remained north of Midway, but drew nearer.

By dawn on 4 June, two days after the attack on the Aleutians had begun, Admiral Nagumo reached his launching point, two hundred and forty miles from Midway. The main Japanese fleet was about a hundred miles astern. At 4.30 a.m. the four carriers sent off a hundred bombers and fighters. Near the island a squadron of American fighters was overwhelmed, and torpedo-aircraft, most of which were shot down, failed to hit the carriers. By 6.30 a.m. Midway was smoking and flaming, but though petrol tanks, installations and aircraft were destroyed, little damage was done to guns and runways. The bombing force lost heavily, and at the start of the flight back to the carriers its commander reported that a second strike was needed.

It is said that Nagumo was less certain than his commander-in-chief that the enemy's carriers were eleven hundred miles away at Pearl Harbor. He was keeping more than ninety aircraft on his decks in readiness for an emergency. Decks, however, had to be cleared for the returning bombers; the torpedo-planes that had attacked him were obviously land-based, and scouts, catapulted from escorting cruisers, had scoured what appeared to be an empty sea. The admiral decided to risk a second strike at Midway, and ordered torpedoes on the aircraft sent below to be replaced by bombs. This took time, and for two hours, while he waited for the first strike to return, his four big carriers were defenceless, except for their anti-aircraft guns and the escorts' fire. The carriers were then steaming ahead to shorten the returning bombers' flight. The Japanese having no radar, it was not until after eight o'clock that one of Nagumo's scouts, having reported cruisers two hundred and forty miles to the north-east, signalled that they had a carrier in company.

Before 6 a.m. Admirals Fletcher and Spruance had been warned from Midway of the enemy's approach, and a strike of a hundred bombers and fighters from the *Enterprise* and *Hornet* was now on

its way. The American aircraft headed to intercept the enemy on his south-easterly course towards Midway. As soon, however, as Nagumo learnt that there was a carrier to the north-east, he altered course ninety degrees to port, warning his returning bombers of this change of direction. The *Hornet*'s dive-bombers failed to find a target, but her squadron of torpedo-aircraft, and that from the *Enterprise*, at first equally unsuccessful, during a cast to the north sighted three of the Japanese carriers. Both squadrons had lost their fighter escorts, but they went in at once to the attack.

It was now about nine-thirty. The last of the Japanese bombers had just landed on the carriers' decks. Earlier arrivals were being hastily refuelled and rearmed. Fighters already airborne swept down upon the two American squadrons, whose very gallant attack ended disastrously. Twenty-five of the twenty-nine old and slow aircraft were shot down by the fighters or by ships' gunfire. Their torpedoes went wide, or were evaded by the carriers. Another twelve, from the *Yorktown*, arriving on the scene as this massacre ended, met with no better success. Altogether, thirty-five out of forty-one aircraft, with their pilots and aircrewmen, were lost.

But this sacrifice had won the Battle of Midway. High above the low-flying torpedo planes came more than fifty dive-bombers from the *Enterprise* and *Yorktown*. The Japanese carriers had been unable to launch more aircraft while manoeuvring violently to evade torpedoes and a submarine. Their airborne fighters were too near the water to gain height in time. Nagumo's flagship, the *Akagi*, and the *Kaga* and *Soryu* were in formation together, all with aircraft crowded on their flight-decks, and upon these the dive-bombers made a devastating onslaught. The second of two hits on the *Akagi* exploded torpedoes on her hanger deck. Four heavy bombs burst on the *Kaga* between decks. Three more hit the *Soryu* as she turned into the wind to launch her aircraft. Within a few minutes the three carriers were furnaces of flame.

The fourth, the *Hiryu*, was some miles ahead of them, and she was given time to retaliate. About midday, when some of the *Yorktown*'s aircraft had returned and were being refuelled, the *Hiryu*'s dive-bombers attacked her. Six got through her screen of fighters. She was hit by three bombs, one penetrating to her

hangar deck and causing a blaze of petrol, while a second went through the side of her huge funnel. Five of the *Yorktown*'s six boilers were put temporarily out of action. The fire was controlled, and after drifting for an hour the ship was got under way again. She was working up to nineteen knots when soon after two-thirty the *Hiryu*'s torpedo-bombers came in low. Firing her guns into the water, the *Yorktown* put up a splash barrage, but five aircraft broke through and she was struck by three torpedoes. Again the engines stopped, all lights went out, and the carrier took so heavy a list that she was thought to be sinking, and was abandoned.

Her own scouts, in the meantime, had discovered the *Hiryu*, screened by battleships and cruisers, a hundred miles to the west. The *Hornet* launched her dive-bombers, and by five o'clock the last of Admiral Nagumo's carriers was blazing like the rest.

At that hour all four were afloat, but were past saving. Soon afterwards, the *Kaga* and *Soryu* were torn apart by internal explosions. The *Akagi*, burnt to a shell, was dispatched by a destroyer the next morning, when the *Hiryu* had also to be sunk.

To set against wholesale disaster, the destruction of two-thirds of their heavy carrier strength, the Japanese could claim a chance success, a duplication of the *Soryu*'s ill-fortune. The *Yorktown* had been abandoned prematurely. As she did not sink, a control party was put on board, her list was reduced by pumping, and she was taken in tow. But on the afternoon of 6 June, when she had a destroyer alongside, a Japanese submarine put two torpedoes into her. A third blew the destroyer to pieces. Some hours later the *Yorktown* went under.

4

In operations between carrier forces the proverbial fog of war has proved baffling to a degree hitherto unknown. High-flying scouts may identify anything from cruisers to tankers as carriers. In battle, the ships engaged never see one another and are often wrongly identified; and experience suggests that claims made by bombing pilots will almost invariably be too optimistic. Carriers hidden by smoke and flame will be reported as sinking, if not sunk. But though so vulnerable, they are constructed to remain

afloat to the bitter end, and as their attackers do not linger on the scene, in the majority of cases only the consorts of some blazing and exploding wreck will witness her fate. Against all probability she may survive. Not one of the five that went down in the course of the Battle of Midway was seen to sink by enemy eyes. Finally, the confusion inherent in carrier warfare will live on long after a battle. Both sides, while making confident claims, will recognize the element of uncertainty and conceal their own losses, so that it may be many months before the truth comes out.

At Midway, the American admirals gained a truer picture of events than Admiral Yamamoto. To the latter, on his huge flagship, far astern of Admiral Nagumo, the fog of war in its new intensified form was aggravated by mangled wireless messages, and during most of 4 June he could make neither head nor tail of the contradictory scraps of news that reached him from his carrier force. At first he was led to believe that there was only one American carrier in the neighbourhood of the island; then that she had been sunk, and he informed Tokyo that the enemy's force was practically destroyed and that he was preparing to pursue the remnants and occupy Midway. Next, however, came a startling report from Nagumo, which seemed to read that he was confronted by no fewer than five American carriers. He was withdrawing, protecting the damaged *Hiryu*. Of the fate of his other carriers there seems then to have been no word. A little later, a further report gave the enemy four carriers. On this erroneous information Yamamoto decided to support Admiral Nagumo, apparently with the intention of launching a general attack on the enemy the next morning. An Aleutian support group to the northwards, and a force under Admiral Kondo escorting the troop transports from the Marianas, were ordered to join the battle fleet. The transports were left to fend for themselves. This concentration would have given the Commander-in-Chief his eleven battleships, twelve cruisers, two light and four seaplane carriers, and such of Nagumo's big carriers as were fit for action. By then, of course, well after midday, none were; and late in the afternoon, when the converging movements had begun, this was the dismaying news that came through clearly from Nagumo. It was delayed, and merely announced that not one of his four carriers was seaworthy.

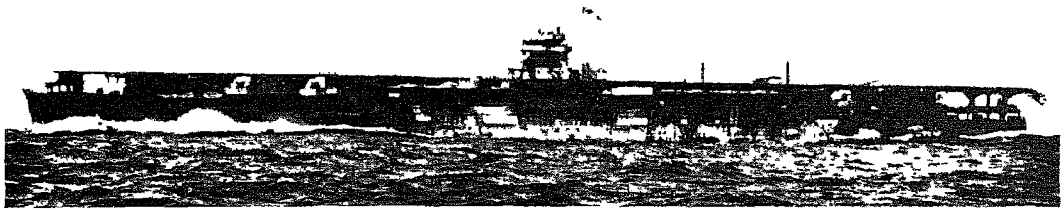
At last Yamamoto began to realize the full gravity of the situation. Without yet abandoning all idea of renewing the battle, he feared a carrier attack at dawn, and turned the main fleet about. While it withdrew to the westward, Admiral Kondo, who had two battleships and four heavy cruisers, was ordered to succour what was left of the carrier force, of which, by that hour, nothing was left but the smoking shells of the *Akagi* and *Hiryu*.

In the meantime, on the other side of the hill, in this case the curve of the eastern horizon, Admiral Spruance with the *Enterprise* and *Hornet*, having also turned away at nightfall, at dawn again steamed west. Conduct of further operations was in his hands, Admiral Fletcher remaining with his flagship, now in tow. Spruance knew that four Japanese carriers had been hit, and were apparently badly damaged, but how badly he was unaware; and hoping to find them he kept his westward course throughout that day, the 5th. Probably the ablest of the American commanders, he could combine caution with daring, as he was to show on later occasions, and to finish off the enemy he was prepared to run risks, for he must have counted on a powerful force being somewhere in the neighbourhood in support of Nagumo's carriers. What neither American admiral suspected was that almost the whole Japanese navy was there, and if Yamamoto had not reversed his own course overnight it is possible that at dawn on the 5th Spruance's two carriers would have found themselves within range of the *Yamato*'s 18-inch guns, which, when at Leyte Gulf they were in action for the first and last time, opened at a range of twenty miles.

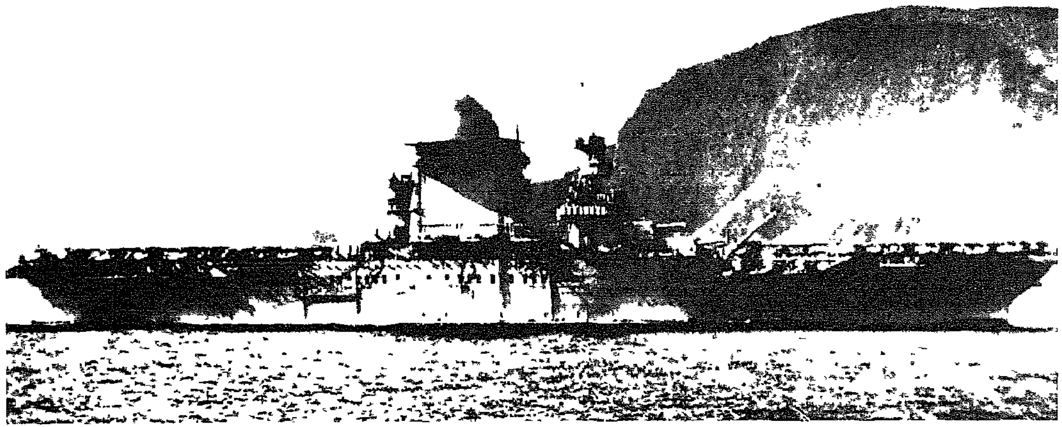
On that morning, however, the sky having clouded over, the carriers' scouts searched in vain. The *Akagi* and *Hiryu* had by then been sunk; Admirals Nagumo and Kondo were making their best speed after the battle fleet; and the troop transports had turned back south-west to the Marianas. During the day Flying Fortresses from Midway and Oahu sighted scattered targets, but claims made by these high-flying aircraft of damaging hits on several cruisers must be treated with more than usual reserve. The only certain further success was scored the next day by the carriers' bombers, whose pilots well deserved it, when they sank the heavy cruiser *Mikuma.*

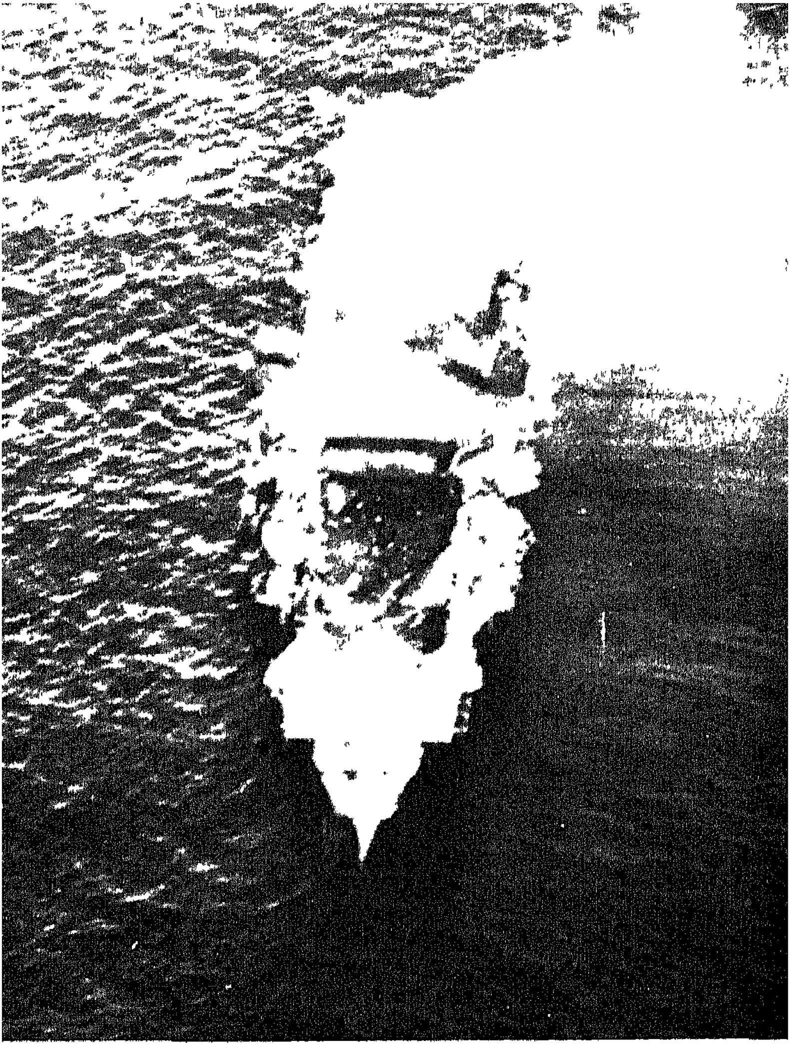
So ended the three-day battle. Admiral Yamamoto had thought

Japanese aircraft carrier *Hiryu*



American aircraft carrier *Lexington*





The end of the *Hiryu*, Midway, 4 June 1942. Photograph taken from a Japanese carrier aircraft

better of his intention to renew it. The American carriers were running short of fuel, and having recovered his aircraft, Admiral Spruance gave up the pursuit.

5

Midway was the decisive battle of the Pacific War. It is seldom that this can be said of a battle fought only six months after the outbreak of a conflict lasting four and a half years. But in the view of the Japanese navy Midway was the turning-point, and at the time its more far-sighted officers must have been appalled at the way the naval situation had been transformed in a few hours. Admiral Yamamoto, whose mistaken use of his carriers did much to bring about what was in fact a national disaster, was no doubt among them.

In the four years of amphibious warfare that were to follow Midway, sea power meant aircraft carriers. Fleets of conventional warships and transports could not undertake major operations in the island-studded western Pacific without air cover of their own. Japan had lost four of her six fleet carriers at a blow, and though five more were building, only one, the *Taiho*, was ready for service before the war was over. She was sunk in her first action, the Battle of the Philippine Sea, in June 1944, when the veteran *Shokaku* and the converted liner *Hiyo* were also lost. Hasty conversions and old battleships whose after turrets were replaced by short flight-decks were miserable substitutes for big fleet carriers with hangars for eighty or ninety aircraft. If the American carrier force, and not the Japanese, had been destroyed at Midway, as might well have happened, Japan would have won command of the Pacific, perhaps for a long period. Though in the long run, no doubt, she was bound to lose the war, she lost it in one early battle.

If Midway was decisive, its influence was infinitely more far-reaching than its effect upon the issue of a single war. For more than four centuries the influence of sea power upon history, to borrow the title of Admiral Mahan's celebrated work, had been exerted through the medium of the big ship carrying big guns. As late as the second half of 1941 an authoritative writer

could state: 'The carrier is not likely to replace the battleship.* Within a few months Midway had altered all that, in a manner plain for everyone to see. From a couple of carriers and a few cruisers, such a battle fleet as had not been seen since Jutland, mounting more than a hundred guns of 14- 16- and 18-inch calibre, turned about and ran away.

* Bernard Brodie, *Sea Power in the Machine Age.*

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N.B. *Battles* and *Ships* are entered under these headings